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EXCELLENT WORK OF CRUISER CHATTANOOGA

The new protected cruiser Chattanooga in command of Com'dr Alexander Sharp went through her trials off Newport on Dec. 31 and Jan. 1, and acquitted herself very creditably both to her builders and officers in charge, proving to be a very efficient and seaworthy ship. The Chattanooga is one of the six protected cruisers of the Denver class. The contract for her construction was awarded to the Crescent Ship Yard, Elizabethport, N. J., but was completed at the New York navy yard. The general dimensions of the cruiser are: Length over all, 309 ft.; beam, 44 ft.; draught, 15 ft. 9 in. Her displacement is 3,200 tons. Her twin screws are driven by two four-cylinder triple-expansion engines of the vertical, inverted type. Steam is supplied by six Babcock & Wilcox water tube boilers of the same type as is being used so extensively in our new navy. They are constructed entirely of wrought steel and built for a working pressure of 275 lbs. The cruiser is designed for a speed of 16½ knots, and is equipped with modern machinery and built in the most approved manner throughout. The firerooms are provided with the closed stokehold system of draft.

There were three sets of trials—standardization trials, four-hour official speed trial and a twenty-four hour endurance run at two-thirds power. All of these trials were run under the direction of the official trial board composed of Capt. James H. Dayton, Capt. J. J. Woodward, Com'dr F. H. Bailey, Com'dr I. S. K. Reeves, Com'dr W. M. Parks, Lieut. Com'dr W. W. White and Lieut. H. C. Dinger. Lieut. Com'dr H. P. Norton was present in the capacity of representative of the builders.

The standardization trials took place on Dec. 31. They were run over the measured mile course in Newport harbor, for the purpose of determining the speed of the ship at different revolutions per minute of the propeller. Fifteen trials in all were made at revolutions varying from 180 to 60 per minute. There were two trials at each speed, one with the tide and one against the tide, the average being taken so as to eliminate the effect of the tide. The four-hour official speed trial was run on Jan. 1. Anchor was weighed about 9:30 a. m. and the ship proceeded down the harbor and out to sea. The weather was fine, there being only a slight southwest wind and very little sea.

It has been the custom to run the four-hour trials over a standard course marked by stake boats at the ends and several intermediate points. As it is difficult to survey an accurate course, this method makes it necessary to take a cruiser to some part of the coast that is well known, such as the course between Cape Ann and Cape Porpoise on the New England

coast. In the case of the Chattanooga a new method was tried. It had been determined on the standardization trials what number of revolutions per minute were required to make the contract speed of 16½ knots, so on the official trial it was only necessary to maintain this number of revolutions for four hours. The run was made out to sea and return. It will be seen that a trial by this method may be run anywhere in deep water. It does away with the expense of six or eight stake boats and the cost of getting the ship from the yard to some known course. It also does away with the necessity of keeping a perfectly straight course and the loss of time turning out for other boats.

The trial was a great success in every way. The engines ran evenly and smoothly and the boilers steamed freely and were well and systematically fired. Steam was maintained at a constant pressure of 265 lbs., and the smoke at all times was very slight, never being deeper than a light gray color. This is gratifying in view of the complaints of dense smoke on some of the new boats not fitted with this style of boiler.

The principal results of the trial were: Revolutions of main engine, 180.5, which gave a speed of 16.665 knots; indicated horse power, 5,390; coal burned per square foot of grate surface, 35.4 lbs.; indicated horse power per square foot of grate surface, 18; coal burned per indicated horse power, 1.97 lbs. These figures show the Chattanooga to be the most economical ship of her class, and, in view of the present friendly competition between private and government yards, speaks well for the latter. The figure of 1.97 lbs. of coal per indicated horse power has not been obtained on any other of our new cruisers or battleships.

On Monday, Jan. 2, the Chattanooga left Newport for her twenty-four-hour endurance run. It will be remembered that a terrific gale sprang up that evening and lasted almost two days, and for part of the time the press reported the safety of the boat to be in doubt. After the storm had subsided she returned to Newport none the worse for her trip, which is ample testimony of her endurance and seaworthiness. The results of the trials reflect great credit upon the personnel of the navy conducting them. Lieut. Graham, in charge of the machinery, deserves special notice, as it was largely due to his efficient management and discipline that the Chattanooga heads the list of cruisers in economy of fuel.

The sale of the property of the Marine Construction & Dry Dock Co., Mariners Harbor, Staten Island, New York, on Sept. 15 last to A. F. Derr has been confirmed by the court. The property has been leased by Mr. Derr to John E. Consalus, who is now carrying on the business.

LIVERPOOL SHIPPING LETTER

Liverpool, Jan. 16.—It is now possible to give something like a complete record of the output of the world as regards ship building and engineering. During the year 1904 just closed the output of shipping of the whole world is some 225,000 tons less than it was in the previous year. The actual figures are:

SHIP BUILDING.		
	Vessels.	Tonnage
1903	2,441	2,677,905
1904	2,332	2,451,900
Decrease	109	225,006
ENGINEERING.		
1903	2,350,845 I. H. P.	
1904	2,306,300 I. H. P.	
Increase	15,554 I. H. P.	

These show a reduction of 109 vessels and 225,006 tons, and an increase of 15,554 indicated horse power. The returns from the Clyde are down by 28,000 tons, and in this category are also the following British ports: The Tyne by 4,505 tons, the Mersey by 20,335 tons, the Humber 6,440 tons, and Ireland by 85,238 tons; abroad, the United States by 168,000 tons, the colonies by 12,130 tons, Japan by 1,305 tons, Austria-Hungary by 9,610 tons, Belgium by 8,844 tons and Denmark by 10,113 tons. The decrease abroad and especially in the United States would have been much larger were it not for the launching of a very large number of warships. In the United States more than three-fourths of the tonnage consists of warships, as for instance in the case of, first, Messrs. Cramp & Sons, who during the year launched five vessels and of these seven-eighths of the tonnage was in government warships, and secondly, at the Newport News yard ten vessels have been launched during the year of 1904 and of these three were for the United States navy and make up five-sixths of the total tonnage. The principal districts which show an increase over 1903 are: In Britain, the Wear by 39,503 tons, the Tees and the Hartlepoons by 39,166 tons and the Thames by 9,000 tons. Abroad, Germany has an increase of 10,930 tons, France of 35,950 tons, Holland of 11,732 tons, Norway and Sweden of 2,334 tons and Italy of 8,580 tons. The leading position in the matter of tonnage launched by any one firm belongs of course to Messrs. Russell & Co. of Port Glasgow (a position they previously held in 1899) with eighteen vessels of 73,680 tons. Though the total output is down in this country, as it is almost everywhere else, yet the decrease of British tonnage in 1904 as compared with 1903 is only some 43,449 tons, as against 182,517 tons for the whole of the foreign tonnage and which is about one-fourth of that of foreign ship builders. Of the above 43,449, the Clyde alone shows a drop of 28,000 tons, and yet its total output is nearly 100,000 tons more than that of the United States and nearly 140,000 tons more than that of Germany, the former having a total of 324,175 tons and the latter 271,942 tons. Following these come the Tyne with 258,220 tons, the Wear with 228,932 tons and the Tees and Hartlepoons with 210,470 tons.

With regard to the future the prospects were never more hopeful. Sir Christopher Furness has evidently faith in the future of the British shipping trade for he has just placed orders for ten new steamers. Eight of the ten are to be built at West Hartlepool, at the yards of Messrs. Furness, Withy & Co. and the Irvine Ship Building & Dry Dock Co., and the remaining two by Messrs. Osbourne, Graham & Co. of Sunderland. The orders are no doubt speculative, and we shall probably hear of the boats coming into the market for sale in due time, and if that is so, the transaction is not without its significance for Sir Christopher is a shrewd judge of the times, and it is clear sees that the present is an opportune time to build. Evidently other ship owners are tak-

ing the view that the present is the psychological time to order new tonnage, for quite an influx of orders is reported on the North-East coast. In addition to the big order for ten new boats referred to above, I learn that another large north-country firm of ship owners are making an important addition to their carrying fleet. This is Messrs. Walter Runciman & Co. of Newcastle-on-Tyne, who have just concluded negotiations with Tyne and Wear firms for three new boats, of which one is to have a deadweight capacity of 6,850 tons, a second of 6,250 tons and a third of 4,650, all being of light draught and due for delivery next autumn. One of the vessels is to be an improved turret-decker, the others being of the ordinary single-deck cargo type. Messrs. Gray & Co. of West Hartlepool have also booked orders for five new steamers, and the Irvine Ship Building & Dry Dock Co. for two, so that, including the ten placed by Sir Christopher Furness, no fewer than twenty vessels have been ordered on the North-East coast of Britain within the past few days. This certainly makes a good start for the new year.

I have obtained the following particulars of the new lines that are to be built for the Canadian Pacific Railway Co.: The two new Atlantic liners that have been ordered by the Canadian Pacific Railway Co. from the Fairfield Ship Building Co. of Glasgow will each be 550 ft. long, 65 ft. broad and 40 ft. deep, and will be of 14,000 tons capacity. This is considerably larger than the largest vessel of the C. P. R. fleet now afloat which range from 8,000 to 60,000 tons. The C. P. R. are of opinion that the turbine system is still in an experimental state, which could not be tried without great risk in their two new boats, and they intend to watch the performances of the Cunard and Allan turbines, before following suit. The new vessels will each carry considerably over 1,000 passengers. There will be three classes. The fleet of the C. P. R. will then consist of 63 vessels, of which the majority are engaged in the Pacific and the inland waters of the dominion. There are fourteen vessels of the largest size allocated to the Atlantic trade. It is satisfactory to learn that the two latest additions to the C. P. R. fleet are intended to sail from Liverpool.

It is estimated that the period required for carrying out the important work of deepening the Manchester ship canal from 26 ft. to 28 ft. will be about two years. The company obtained the necessary powers in the last session of parliament, in the face of great opposition from Liverpool, and operations have now been commenced in connection with the scheme. On the tidal portion of the canal from Eastham to Latchford locks, the additional 2 ft. of water will be obtained by raising the sills of the tidal openings. From Latchford to Manchester the waterway is an ordinary inland canal, and the increased depth on this section is to be secured by dredging. If the same method of deepening were adopted in the case of the tidal portion, however, it is calculated that the work would take six years to complete and the cost would be much greater than that involved in the present scheme. The necessity for deepening the ship canal arises from the increase in the tonnage of vessels which has taken place in recent years. When the canal was constructed there were comparatively few ships afloat that could not have used the waterway, but now there are many, and for the purpose of the development of the port of Manchester the waterway must be fully adapted to the requirements of the present day traffic. The company's scheme will improve the navigation of the tidal portion of the canal by diminishing the velocity of the currents and will decrease the amount of dredging.

Orders have been issued by Supervising Inspector General George Uhler of the steamboat inspection service that hereafter steamboat inspectors must personally inspect all life preservers and not accept the stamp of the factory inspectors as sufficient.

POTENTIAL SEA-CARRYING POWER

By Salvatore Raineri, Genoa.

Napoleon described the potential power of a fighting army as the product of the mass of soldiers by the velocity at which they were thrown against the enemy, just like the "quantity of motion" in mechanics. No different was Nelson's opinion, as appears from the suddenness of his tactics. Cesar was the greatest teacher of these great captains, when he pronounced the celebrated motto: *Veni, vide, vici*. All this would teach us that the same tactical principle as governs belligerent armies and navies should also be applied to merchant navies, in the peaceful fighting and struggle of trade and commerce, inasmuch as that navy will be victorious that is run at the highest speed, the word "speed" meaning in this instance the resultant element of actual and efficient work. This conclusion is so obvious that it does not require any longer explanation.

But, to confine ourselves to the estimation of sea-carrying power, unless we adopt some uniform unit of measurement, we shall be utterly unable to compare two or three merchant navies together, on account of the different speed not only of individual ships, but still more of the general average speed for each flag, to say nothing of the considerable difference between steam and sail. The necessity of aggregating tonnages according to similar terms was recognized long ago, when John Williamson, F. de Lesseps, and others devised the well-known rule that each ton of steam equalled three tons of sailing tonnage, because, owing to the then moderate speed of self-propelling vessels, on an average of about 10 knots, it was assumed for the time that while the steamer made three voyages, the sailer made one. Kiaer, the great Scandinavian statistician, adopted the same criterion, which prevailed for a long time. But the enormous increase of steam tonnage of very high speed and the coeval gradual decrease of sailing vessels have led us to ask whether we shall continue to gauge the bulk of the world's tonnage on the basis of the sailing ton, which is fast disappearing? Why should we transform into sailing tons the potential carrying power of the 25-knot Cunarders, for instance?

To face the increasing speed of steam, Sir Robert Giffen and Mr. Stanley Mitcalfe are suggesting a $3\frac{1}{2}$ co-efficient, while Mr. Mulhall, in his celebrated "Dictionary of Statistics" adopts 4. Still all these gentlemen would find great difficulty in demonstrating why they advocate a $3\frac{1}{2}$, 4, or even 5 co-efficient; and we are still in doubt whether all these different co-efficients are to be applied equally to the turret steamer of 9 knots, the Carpathia of 15, and the Deutschland of 23, as also indifferently to the fleets of Great Britain, Norway, and Greece. Mr. Mitcalfe states further that he has adopted his multiplier of $3\frac{1}{2}$ for a period of thirty years but he had lost sight of the fact, perhaps, that during that period the average ocean speed has almost doubled.

We therefore, see the evident necessity of adopting some standard unit, to which all the vessels and fleets of any speed could be referred, independently of the mode of propulsion. This is the Ton-10-miles, or, to explain, a unit ton-capacity of shipping, traveling at a speed of 10 knots an hour, which is the speed of a great mass of shipping. Then the boat propelled at a 20-knot speed is equivalent to a 10-knot boat of double that tonnage, and so on. As to the sailers, it should be remembered that Williamson's rule remains unchanged. Only, instead of saying that the steam ton equals three sailing tons, we shall say that the sailing ton is equivalent to one-third the steam ton; at the same time the speed of the sailing tonnage, according to our standard, will be 1-3 of 10; that is 3.33 knots. It may be objected that sailers very often go faster than that, and the Thermopylae, as also Sir Lancelot, may be adduced; but calms and harbor delays must

be taken into account, and at any time a more reliable figure may easily be estimated.

Another question is whether the carrying power is to be referred to the dead weight, cubic capacity, or gross or net tonnage measurements, and how and whether the space of passenger accommodation should be considered. Of course, this is a matter of secondary importance, although it is worth discussing at some future international congress. Nevertheless, the usual course is to take the net register tonnage and work it out accordingly. My own rule, which first appeared some fourteen years ago in the "Cyclopedia of Industry and Arts," is as follows:—

I.—Sum up the net tonnage of the several classes of vessels, arranged by speed, sailing vessels coming, of course, into one single class of, say, 3 1-3, 4 or 5 knots.

II.—Multiply each total by one-tenth of the corresponding speed.

III.—The carrying power will be the aggregate of all these partial producers.

The result is expressed in equivalent standard tons—that is, one net register ton capacity—moved at a speed of 10 knots an hour, which is only in accordance with actual facts.

Suppose you intend to reduce to a standard speed v a certain amount of shipping tonnage of any kind, P , traveling at a well-known speed V , you will have the equation

$$P V = v x_p$$

where x_p will be the equivalent tonnage required, hence

$$x_p = P \cdot \frac{V}{v}$$

Now, taking as standard the uniform speed of 10 knots, the formula turns out—

$$x_p = P \cdot \frac{V}{10}$$

that is: "The equivalent tonnage, or potential carrying power, equals the actual register tonnage (sail or steam) multiplied by one-tenth of speed."

I may add that in recent years Professor Armand Théry in his excellent work on "Les Etats-Unis d'Amerique," as also M. Marcel Dubois in his "Precis de Geographie Economique," quoted M. Bureau's opinion that in calculating the potential power of shipping the sailing tonnage should be divided by 3.

Many objections have been raised in these columns against my method, which alas! appeared to me simplicity itself. It has been objected that my method is not so very exact, because of the different efficiency of types of vessel, average age, character of shipping, capability and shrewdness of masters and crews, spirit of enterprise in the managing staff, and so on. It is as if we decided to renounce measuring the distance between the earth and the moon, because we realize that we shall never succeed in reaching the approximation of a mile or cable. It is the relative position of the results that must be considered as a matter of comparison; and it is more convenient to obtain relative, but reliable values, like those afforded by my formula, than to work out gigantic figures, based upon a unit of sailing tonnage, that is rapidly disappearing—an imaginary measurement that is, now, against nature, and, therefore, against good sense.

As to the value, from the point of view of statistical work, of entrances and clearances of vessels, I fear they are utterly useless for the object desired, and I wonder at such data being still collected by government officials without any uniform logical method. Suppose, for instance, there were some statistical bureau on the face of the earth where all entrances and clearances of every single ship were recorded as many times as she called at any place in her coastwise navi-

gation. If she called at ten intermediate ports on her actual journey, there and back, then the clerk at the central office would note 20,000 tons if 1,000 was the net register tonnage of the vessel in question. And what meaning could you derive from that?

THE VALUE OF IMPACT TESTS

A paper treating of impact tests on the wrought steels of commerce brought out comment of striking character at a recent meeting of the Institution of Mechanical Engineers. The tests suggest that there are certain curious properties of steel not explained by reference to tensile test and chemical analysis. One of the speakers, Michael Longridge of Manchester, gave a number of instances along this line. He had a large connecting rod bolt break $\frac{3}{8}$ in. below the thread, where it passed through the cap and bearing. There was no shearing stress and the tensile stress was evidently less than at the threaded portion. The break was clean as if the bolt had been cut squarely. In another case a boiler had split near and parallel to a longitudinal seam. There was nothing to indicate cause of crack and the plate was sent to Prof. Arnold for examination. The chemical and mechanical tests were good and the professor could only say the plate possessed "potential brittleness." Mr. Longridge advocated the standardisation of shock tests and opposed the use of a square test bar. The sharp edges of a square test bar might, if rough, start cracks at the first blow. He suggested a cylinder $\frac{3}{4}$ by 4 in. as a suitable form of test bar for the purpose. S. A. Houghton, who had made some tests for Mr. Yarrow, was of opinion that the ideal test was to break the steel by similar stresses to those which the material would receive at work. The failures in machines at work showed that there was practically no contraction of area and no elongation at the fracture. This proved that the strains producing fractures in machinery were seldom those found in the tensile test machine. The ductility shown by the tensile test might be argued as a sufficient guide to suitability of the material under examination, but the speaker thought that engineers had found that ductility represented by the tensile stress was not sufficient. A notched bar test met his approval as analogous to actual working conditions. Propeller shafts with liners on them had a marked discontinuity of strength similar to the notch. In a heavy seaway or with ships in ballast the shaft was exposed to severe blows and the same effects were experienced as in a notched bar. Messrs. Yarrow & Co. had had a boiler failure under hydraulic test which showed the peculiar results under subsequent examination as in the case of the one mentioned by Mr. Longridge. Four test pieces had been taken from the boiler plate, two from the outer edge and two from the middle. One of each of these was heated to a bright red in a nonoxidizing flame and slowly cooled. The others were tested under normal conditions. About thirty blows might be considered the limit with this class of material. In the normal condition as cut from the damaged boiler plate the outer specimen broke with three blows and the inner with five. The annealed samples broke at twenty-six and eighteen respectively. Clearly the plate was brittle, but this was not disclosed by the chemical analysis and the tensile test.

Dr. Stanton held that the impact test to destruction did not form an accurate measure of the resistance of the material to shock, from an engineering point of view—that is to say, shock which did not cause permanent deformation. Some experiments made at the National Physical Laboratory showed that with the two types of test together it was sometimes difficult to say which of two materials was superior. Taking two specimens from a number differing in shock strength and one of these broke at a single blow, the other only failed after forty-three blows. A specimen taken from the first stood repeated shocks 50 per cent. greater than the shock producing

definite permanent set on the bar which successfully withstood forty-three blows. He believed that resistance to shock could be definitely measured by tensile tests with the use of a good extensometer.

The president, J. H. Wicksteed, did not think impact had the slightest effect on a piece in breaking, nor would the impact on a notched bar disclose anything not equally told by static loading. Notching the specimen simply made it break locally. He gave diagrams illustrative of conclusions to be obtained from reduction of area under test. One showed results from a piece which attained the strength limit with a reduction of 50 per cent in area. The other gave a typical diagram from a piece which went to the higher strength limit and then broke without local reduction of area. The latter would be brittle material and the former would be ductile material.

The discussion easily demonstrated the necessity for checking the results of chemical analysis by the physical tests and particularly the desirability of a close comparison of the various items set forth in the latter series. The reduction and elongation of specimens under tests are commonly noted by the investigator and the discussion exhibits anew how essential they are to a knowledge of the ductility or brittleness of the sample and its capabilities when at work as a machine element.

IMPROVEMENTS AT BROOKLYN NAVY YARD

The navy department is in receipt of a memorandum from the special board detailed to consider needed improvements at the Brooklyn navy yard. The formal report has not yet reached Washington, but it will recommend the scheme of improvement suggested at that yard by the two boards which have previously considered the subject. The improvement of water front at the various yards is one of the most important subjects with which the navy department has to deal, especially in connection with the repair, within a reasonable time and on an economical basis, of vessels of war. One of the items in the naval estimates was \$750,000 for the improvement of the water front at the New York navy yard and Rear Admiral Capps regards this item "as one of the most urgent in the whole appropriation bill." He added in his statement to the committees:

The navy yard at New York is at present the best equipped navy yard in the United States, and on account of its being so very accessible to the sources of labor and material, this station should be kept in a condition to meet at all times the demands of the service. At the present time the available berth space in the immediate proximity to the shops is exceedingly limited, providing accommodation for not more than two battleships in addition to the Connecticut, which vessel must of course occupy a berth adjacent to the shops for a long while to come.

He says it will be sixteen months before the Connecticut is away from the yard. So long as the difficulties of getting to the vessel exist, the cost of repairs in such cases is increased from 20 to 40 per cent, dependent on the location of ships in relation to the shops. The improvement most recently recommended contemplates the removal of a portion of the cob dock and the building of piers on the sides of and close to the ships. Rear Admiral Capps is at work on a plan by which the naval repair work will be distributed throughout the naval stations, so as to keep the present force of expert workmen employed as far as possible and prevent the congestion and stagnation of work which have rendered the employment of labor at navy yards unsatisfactory in the past.

The English government will build ten submarine boats of the type under recent trial at Barrow harbor. These will probably be constructed at the yards of Vickers' Sons & Maxim, Ltd.

DISPATCH IN HANDLING CARGO

Some days ago several New York papers printed a special dispatch from Galveston to the effect that a record had been made at discharging a steamer at that port. It stated that a steamer arrived at that port at 8 o'clock Tuesday morning and at 2 o'clock Saturday sailed for Bremen. She was 4 days, 6 hours in port during which time she discharged 6,000 bags of cement, 3,014 crates of empty bottles, 1,200 sacks of sugar, rice and seed and 460 casks and other packages of general merchandise. Her outward cargo comprised 13,400 square bales of cotton, 2,300 round bales of cotton and 900 tons of meal. The report was printed in such a way as to indicate that this was a record dispatch. Many steamship men took exception to it, declaring that it was very far from being a record as vessels had been "turned around," as the saying is, at the port of New York every day in much quicker time. As an instance of quick handling New York papers say that the Kroonland, of the Red Star Line, arrived at her pier in New York Dec. 21 at 3 o'clock p. m., too late to land 1,000 steerage passengers that night. Consequently, she could not commence discharging cargo until 7 a. m. Dec. 22. She sailed Dec. 24 at 10:30 a. m. During the period intervening—just half the time consumed by the vessel at Galveston—the stevedores discharged the following cargo: 3,009 pgs. mdse., 847 cases champagne, 116 cases wine, 1,556 pgs. colors, 4,103 cases window glass, 130 cases plate glass, 180 bbls. clay, 1,010 bbls. straw covers, 217 cases paper, 168 casks bleach, 387 bbls. hops, 3,806 bags fertilizer, 94 bales corks, 623 cases chocolate, 1,502 bbls. salted hides, 146 cases mineral water, 211 coils rope, 206 pgs. ivory, 69 bags rubber, 281 pgs. cheese, 107 tubs cheese, 14 bales nuts, 1 case auto, 20 pgs. bottles, 276 bales hair, 430 pgs. skins, 130 bales raw silk, 100 cases chalk, 223 bbls. iron, 200 bales wood pulp, 127 bales glue, 211 casks china, 100 bags mdse., 200 bags mdse., 353 cases preserves, 367 bbls. baskets, 230 bbls. willows, 103 cases glassware, 198 cases tiles, 53 cases plants, 60 bales flax, 124 cases arms, 177 pgs. grapes, etc., 25 pkgs. potash, 4 casks skins, 50 bags stearine, 7 cases tobacco, 3 pgs. diamonds.

Her outward cargo was as follows: 78,341 bu. corn in bulk, 57,125 bu. wheat, 345 boxes bacon, 89 tierces provisions, 151 tierces provisions, 25 half-bbls. provisions, 102 tierces lard, 30 half-bbls. lard, 1,250 tubs lard, 1,500 pails lard, 2,212 bbls. oil, 100 sacks wax, 95 bbls. grease, 8 tierces oleo, 100 bbls. apple waste, 3 bbls. green apples, 2,340 cases evaporated apples, 2,770 cases dried fruit, 300 sacks dried fruit, 300 cases sausage, 95 cases cured meat, 300 cases extract, 700 cases Quaker oats, 10,187 sacks oilcake, 2,815 sacks distilling grains, 845 sacks set. lines, 800 sacks clay, 205 sacks beans, 313 sacks cereal, 150 bales cotton, 100 sacks cotton waste, 83 sacks leather, 4 sacks hair, 8 sacks rubber, 261 sacks tobacco, 140 hlds. tobacco, 701 cases tobacco, 370 bbls. zinc oxide, 1,018 rolls wood pulp, 1,081 pgs. lead, 7 logs mahogany, 821 bbls. tin scrap, 7 hlds. tin scrap, 2 cases tin scrap, 120 old car wheels, 5 kegs gold, 84 pgs. radiators, 52 cases shoes, 1,082 pkgs. sundries, 18 boxes tobacco samples. The deadweight tonnage was 6,900 tons, equalling 9,950 measurement.

The newspapers say that according to the cargo handlers no other port in the world can be compared with New York in the matter of "turning around" steamships in quick time.

Of course comparisons are unfair, but in the matter of "turning around" steamships no place in the world can compare with the great lakes of North America. As an instance the steamer Augustus B. Wolvin actually loaded 9,945 tons of ore in 50 minutes actual working time. She was in port altogether 1 hour and 15 minutes. This cargo was discharged in 4 hours, 6 minutes actual working time, though she was at dock for 4 hours and 30 minutes. Of course, any comparisons that may be made between the discharge of bulk freight, such as iron ore, and general merchandise are unfair; but dispatch is dispatch.

REDUCED SHORTAGE BY 70 PER CENT

Junius S. Smith, lake weighmaster, has just filed his annual report with the Buffalo Chamber of Commerce. He says that the decrease of about 40,000,000 bu. in grain receipts for the season of 1904 made the work unprofitable but the average shortage was not very serious—a peck per 1,000 bu. The receipts of grain and flax seed by lake were as follows: Wheat, 26,270,000 bu., corn 27,898,000 bu., oats 19,124,000 bu., rye 1,736,600 bu., barley 15,605,000 bu. and flax seed 10,144,400 bu., total 100,838,000 bu. Mr. Smith says in his report:

"The original appointment of weighmaster was made at the urgent request of the vessel interests. A few weeks' trial convinced me that much more than mere tallying was needed in order to accomplish practical results, and as soon as concerted action could be arranged for, the present system of tests and checks was adopted, with the effect of reducing the average shortage fully 70 per cent. Errors will occur, mistakes will happen with the utmost care, but the great change speaks for itself. Some vessel owners and managers have failed to do their part in the matter, but it is hoped that these will see the fairness of turning their work into this channel."

The table showing the amount weighed under the supervision of the lake weighmaster follows:

	Bill of lading.	Short.	Over.	Average per 1,000 bush.	Equal in Wheat lbs.
Wheat	13,491,354	4,755	3,322	0.10	6
Corn	17,540,700	9,388	4,814	0.26	16
Oats	12,043,800	8,246	3,093	0.35	21
Rye	1,185,177	630	218	0.347	21
Barley	8,412,403	6,250	3,392	0.34	20
Flax Seed	5,043,393	1,005	0
Bushels per bill of lading.	57,717,097	30,283	15,739	0.25	15

WELDING TEST WITH THERMIT

At the experimental test to decide the adaptability of the Goldschmidt thermit welding process to marine repair work, held at the yard of the Dunham Towing & Wrecking Co., in Chicago last week, several hundred prominent marine and foundrymen saw a 7-in. anchor stock solidly reunited in less than half a minute. The process consists in fusing a chemical mixture of aluminum and iron oxide in which steel shavings have been mixed, in a mold fitting over the fracture. When burning the mixture attains a degree of 5,000 Fahrenheit. As an illustration of the fusing power of the mixture, a heavy steel plate was perforated by a jet of the blazing liquid as cleanly as though struck by an armor piercing shell. The test was entirely satisfactory and is believed to be of much use in marine lines.

A regulation just issued by Canadian steamboat inspectors requires all vessels trading between Canadian ports to be subject to the provisions of the Canadian steamboat act, regardless of where they are owned. The order will affect an immense amount of tonnage brought from Europe for the lake trade and will also apply to pleasure yachts owned by Americans touring in Canadian waters. Among the English built craft now trading in Canadian waters which will require re-inspection are the steamers Stratheona, Donnecona, Wahcondah and Neepawah, owned by the Hamilton-McKay Co. Formerly all boats which had passed the English or French Lloyds, the British council for the survey and registration of shipping, or the Norwegian Lloyds, were free to ignore Canadian regulations regarding construction and crew. It is likely that the government will be asked by vessel owners to make at least the inspection of English Lloyds acceptable.

It is reported that the Lee Line, Memphis, Tenn., is to build two new steamers with steel hulls for their Mississippi river service. The vessels will cost approximately \$100,000 each.



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During the past week the Marine Review has been the recipient of letters from United States senators and representatives concerning the status of the shipping bill. Nearly 200 of these letters have been received, and in almost every instance the writer expresses the belief that something should be done to build up the merchant marine in the foreign trade. Some of them express fear that the bill may not pass at the present short session of congress, but none of them has really abandoned the hope that it will pass. The chief fear, of course, is the brevity of the session, the crowding in of measures that must be attended to, mainly the appropriation bills, and the knowledge that any hostile senator who chooses to talk the bill to death, can do so.

The Review has also received during the week certain letters asking why foreign ships should not be permitted to carry American products as long as they carry them as cheaply as any one could carry them. It must be contended that this is only looking at the situation in a half light. If the carriage of products abroad, that is the mere crossing of the waterway was all, foreign ships might do the work quite as well as American ships provided they did it as cheaply. But that is by no means all. If American trade is to be developed to its fullest extent the foreign market must be cultivated by American agents. No manu-

facturer would employ the representatives of a rival house to introduce his goods into new markets. The American ship is absolutely a necessity to the full development of American trade. Branch houses will not be established in foreign countries unless the avenues of connection with the home establishment is American. The American ship is the messenger of the American house. How truly this is so is illustrated by a recent report of the foreign trade of Russia. For the past twenty-five years the Russian minister of marine has encouraged in every way the growth of the Russian merchant marine with the result that Russian ships now carry an excellent percentage of its foreign trade. The Russian foreign trade amounts to \$600,000,000 per annum of which the major portion is transacted with Great Britain, France and Germany. The United States has scarcely any of it and its deficiency in this respect is attributed by the Russian writer to the fact that American ships are rarely seen in Russian ports.

The Review has also been asked the question as to what subsidy Britain pays to its cargo carrier. Britain pays no subsidy to its cargo carrier. It pays about \$6,000,000 per annum in admiralty subventions, retainers for sailors and postal subsidies. It began the policy when steam became a commercial factor for vessel propulsion by paying generously subsidies to steamers for carrying the mail to foreign ports. It is not pretended that the money spent was merely for the carriage of the mails, because it was out of all proportion to the services rendered in that particular. In ten years Britain paid \$60,000,000 to its steamers for carrying the mails, a sum that was vastly more than the value of the steamers engaged in the service. But when the British manufacturers saw they had an avenue of communication to the distant parts of the world they cultivated trade with those quarters until their trade connections now are firmly established. Everyone knows it is difficult to up-root a trade when it is once established. The money that was generously paid to steamship owners found its way, of course, into every ship yard in Great Britain until it became the great ship and engine building nation in the world. The contention is that if the United States will simply perform the same service to its merchant marine that Britain did for its own it will not take the United States very long to gain its lawful percentage of over-sea trade.

A meeting, the significance of which is quite apparent, was held in Cleveland on Wednesday of this week when the Shipmasters' Association held their annual session in that city. For the past few years the relations between masters and owners have not been all that they should be. The master felt that his authority was gradually being taken away from him, and that the ship was frequently being managed by those subordinate to him. This culminated last sea-

son in the strike of the Masters & Pilots' Association. The masters lost that strike but achieved a virtual victory. At the meeting this week it was almost spontaneously suggested that the owners of vessels become members of the Shipmasters' Association, which is purely a social and beneficial organization and is not to be confounded with the Masters and Pilots' Association. The suggestion to enter the Shipmasters' Association was kindly received by the owners and they will undoubtedly be made honorary members of the society. The owner feels that he should be closer to the master than he has been during the past two or three years. This view of the case was emphasized by Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., for many months past, and it was he who at the meeting of the Lake Carriers' Association in Detroit recently asked that the masters be invited to share in the deliberations of that body. It is quite clear that the bond between the masters and the owners will be closer in the future than it has been in the past.

ENGINEERS SUBMIT WAGE SCALE

The most interesting thing which the Marine Engineers' Beneficial Association did at their annual meeting in Washington last week besides the election of officers as reported in last week's issue of the Marine Review was the adoption of a wage schedule for the great lakes. The schedule adopted provides for an advance of \$25 per month for the chief engineer of all steamers of 5,500 gross tons and over. These steamers are designated as Class A and this new class is made to embrace the new giant freighters which have been a feature of lake construction during the past year. Among the older vessels there are none in the 5,500-ton class except the J. J. Hill, John W. Gates, Wm. Edenborn and Isaac L. Elwood. The new classification is therefore intended to put the Wolvin, Sahara and the four new Steel Corporation ships, the vessels building for the Cleveland-Cliffs Iron Co. and for Mr. Tomlinson in a class by themselves. The schedule also calls for three engineers on these freighters. The schedule which is based upon a monthly scale calls for a year of ten months.

Vessel owners in general have little to say about it but it is hinted that the Steel Corporation will not consent to put its larger steamers in a class by themselves. It is represented that it requires neither greater skill nor labor to operate one of the new ships than it does one of the old ones and that therefore there is no reason for distinguishing these ships from the rest. No difficulty is expected in adjusting wages, however, though owners are not disposed to allow for a season of ten months. The classification and wage scale adopted by the engineers follows:

- Class A, bulk freighters—All steamers over 5,500 tons.
- Class B, steel bulk freighters—All steamers over 2,100 and under 5,500 tons.
- Class C, steel bulk freighters—All steel steamers over 500 tons to 2,000 tons.
- Class D, steel bulk freighters—All steel steamers under 500 tons.
- Class A, package freighters—All steel package freighters of 1,800 tons.
- Class B, package freighters—All steamers from 500 to 1,800 tons.
- Class C, package freighters—All steamers not included in classes A and B.
- Passenger steamers—Class A, all steel passenger steamers over 1,200 tons; class B, all steamers from 300 to 1,199 tons; class C, all steamers not included in the above.

Wooden freighters—Class A, all steamers over 1,200 tons; class B, all steamers over 600 to 1,199 tons; class C, all steamers of 200 to 599 tons; class D, all steamers not included in classes A, B and C.

Wooden package freighters—Class A, all steamers over 750 tons; class B, all steamers between 300 and 750 tons; class C, all other steamers not included in classes A and B.

Wooden passenger steamers—Class A, all steamers over 1,200 tons; class B, all steamers between 300 and 1,200 tons; class C, all steamers not included in classes A and B.

WAGES ON STEEL STEAMERS.

Bulk freighters, class A—	Per month.
Chief engineer	\$175
First assistant	115
Second assistant	80
Class B—	
Chief engineer	150
Assistant	100
Class C—	
Chief engineer	125
Assistant	90
Class D—	
Chief engineer	105
Assistant	75

WAGES ON WOODEN STEAMERS.

Class A—	Per month.
Chief engineer	\$125
Assistant	90
Class B—	
Chief engineer	114
Assistant	84
Class C—	
Chief engineer	105
Assistant	75
Class D—	
Chief engineer	95
Assistant	65

NAMES OF STEAMERS UNDER CONSTRUCTION

Names of steamers are always interesting and especially are they interesting at this time when so many steamers are building for large corporation interests. It was announced last week that the new steamer building for Pickands, Mather & Co. at the Detroit yard of the American Ship Building Co. would be named after Samuel Mather but this was an error. This steamer will be named after Amasa Stone. The great steamer building at Lorain for the Acme Steamship Co., which owns the Augustus B. Wolvin, will be named the James C. Wallace in honor of the president of the American Ship Building Co. The steamer building at the Detroit yard of the American Ship Building Co. for Mr. Dan R. Hanna and others of Cleveland will be named after Mr. Paul Stackhouse, president of the Cambria Steel Co. The steamers building at the Lorain yard for the Niagara Transit Co. of Buffalo will be named Wm. A. Rogers in honor of the president of Rogers, Brown & Co. The big steamer building at Lorain for the Buffalo & Sasquehanna Steamship Co. will be named Stephen M. Clement after the president of the Marine National Bank of Buffalo. The four great steamers building for the Steel Corporation will be named E. H. Gary, Wm. E. Corey, George W. Perkins and Henry C. Frick. Mr. Tomlinson's two steamers building at Bay City will be named Scopa and Sylvania. The two Cleveland-Cliffs steamers building at the yard of the Great Lakes Engineering Works of Detroit will be named after Wm. G. Mather and Peter White.

Estimates presented in the house of commons at Ottawa include the following: Amherstburg harbor, improvements of channel, etc., including purchase of land, \$30,000; Belle river, dredging and renewing protection work, \$4,000; Point Edward, dredging, \$17,000; Port Stanley, harbor improvements, \$70,000; Rondeau, harbor improvements, \$70,000; Sarnia, dredging, \$10,800; Sault Ste. Marie, canal improvements, \$100,000.

NEEDED IMPROVEMENT IN CHANNELS

Another Crossing at the Lime Kilns and a Third Lock at the Sault—President Livingstone's Annual Report

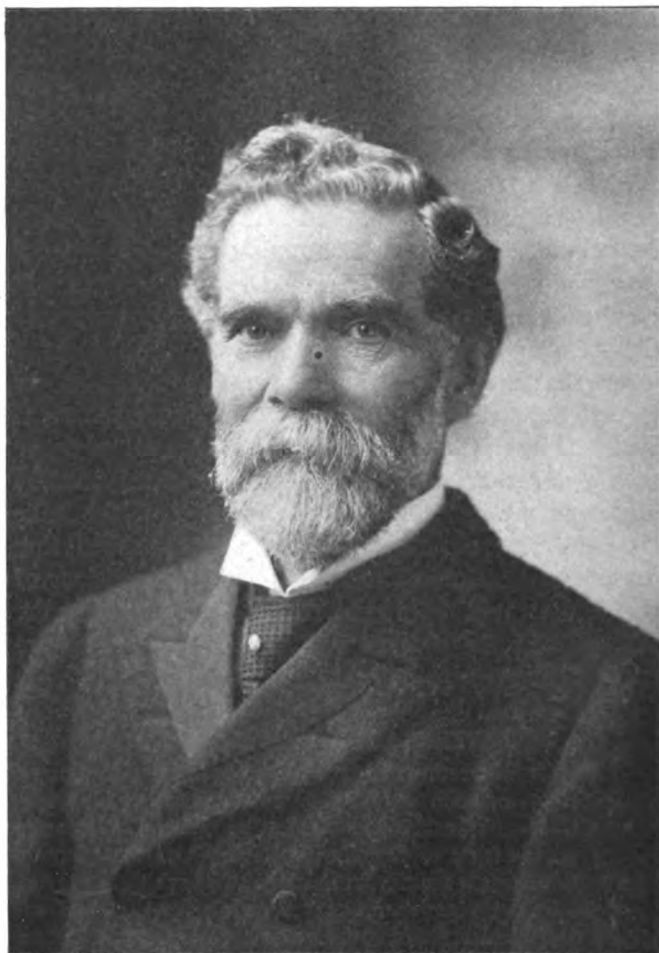
Mr. William Livingstone, president of the Lake Carriers' association, discussed many points of interest to vesselmen in his annual report. Among them was another crossing at the Lime Kilns and another lock at the Sault. He said:

Owing to the large increase of tonnage on the lakes and the new record established during the past year in the size of vessels and the rapidly growing congestion which already exists on the Lime Kiln crossing, it makes it imperative and of the utmost importance that we should bend all of our energies to secure at the earliest possible moment the passage of a bill for an appropriation for the construction of a new crossing at the Lime Kilns.

The tonnage of the lakes has increased so enormously in the last ten years, and seemingly bids fair to increase at a still more rapid rate the next decade, that 99 per cent of the risk of navigation now is in collision. Our modern ships are built on such lines and of such construction that the dangers of shipwreck or stress of weather have been reduced to a minimum. The result is that our greatest danger in navigating the great lakes is from collision in the narrow channels, and should one of our large modern ships be sunk in the crossing, blocking the channel, it would tie up the entire tonnage of the lakes until she was removed, and the loss entailed thereby would be difficult to estimate.

Great as the necessity was for the building of the new canal now under construction at the St. Clair Flats, there is still a greater necessity for this crossing at the lower end of Detroit river. The risk under present conditions is very grave and constantly becoming more so. The loss entailed by the sinking of the little steamer John N. Glidden last year in the Flats canal, and which only partially obstructed the canal, but entailed great loss to carriers and shippers, is too recent an object lesson to be forgotten. The sinking of the steamer W. L. Brown at the Lime Kiln crossing a year ago, and which only partially blocked the channel, is a recent example of the great loss which may occur at any time at a single channel. The steamer Douglas Houghton, in 1900, before the present improvements were completed in the "Soo" river, blocked the entire navigation of the upper lakes for a whole week and entailed an immense loss at that time to vessel owners and shippers. Therefore every possible effort should be made to secure the passage of a bill for the building of a new channel, as even with the greatest success which we could hope to attain in the passage of the bill, long before a second channel could be completed the present channel will have become an absolute menace to navigation and utterly unable to accommodate the rapidly growing tonnage of the lakes without serious detentions and danger.

In this connection we have been at work for over a year endeavoring to secure the removal of the railroad bridge between Grosse Ile and Stony island. This bridge was built originally in 1872 and 1873 by the Canada Southern Bridge Co., an auxiliary corporation to the Canada Southern Railway, which crossed the Detroit river for the purpose of transporting cars to the Canada side of the river in connection with the Canada Southern Railway. It is a low bridge with no draw, resting on stone piers in the river, with a 150-ft. span. I am pleased to state that we have finally succeeded in getting the bridge condemned by the war department, and that quite a portion of the bridge with its abutments in the river is to be removed so that it can be used for navigation by May 1, and the Michigan Central Railroad Co., who now own the bridge, have agreed to have the work of removal completed at that time. With the removal of this bridge a channel of moderate depth would be obtained between Grosse Ile and Stony island, Sugar island and Bois Blanc island, which could be used by



MR. WILLIAM LIVINGSTONE,
President Lake Carriers' Association.

passenger and light-draft vessels, and would to some extent relieve for the time being the congestion we now have on the present Lime Kiln crossing. By asking for a preliminary examination, and if approved, the United States engineers, by sweeping the channel, removing some boulders, hummocks, etc., could, at a comparatively reasonable expense, get a fair depth of water for passenger and light-draught vessels, which could be steadily improved thereafter.

When the Poe lock was built it was built for 20-ft. navigation, but since that time (20 years) Lake Huron has lowered somewhat, and there is only about 19.2 ft. average depth over the sill. Col. Davis' proposition is to deepen St. Mary's river so as to have 21 ft., and therefore the lock must have that depth over the mitre sill.

The same reasons which make it an absolute necessity that we should have a new crossing at the Lime Kilns are of equal force and necessity for the new lock at the "Soo." A good deal of trouble was found taking vessels out of the Poe lock, but by opening two valves in the upper gate a current was obtained through the lock which floated them out. There has been considerable discussion among the engineers as to the site best adapted for the purpose. Col. Davis, United States engineer in charge, has recommended putting in a lock about 1,300 ft. long and 70 or 75 ft. wide, figuring on the basis of a maximum length of vessels of 600 ft., and 60 ft. beam, and have them go through the lock tandem. It is estimated that the construction of this lock will take about four years. Last year it took 1 hour and 24 minutes to get vessels from one end of the canal to the other. He believes that a saving of time can be accomplished by this plan. The estimated cost of the new lock will be about \$3,300,000, and as soon as the new lock is completed, the mitre

still on the Poe lock could be lowered and vessels could go through either lock loaded to 21 ft.

In December, 1886, Gen. Poe outlined a project for doubling the capacity of the present canal at the "Soo;" that is, the cross section above the locks, by means of the addition of a second channel, the two channels being separated by a long, narrow island around the railway drawbridge. On this project no action was taken during his life. It has come up in various forms since that time, but finally assumed definite shape by Maj. Bixby about two years ago submitting and recommending to the government, on account of the great increase of tonnage on the lakes, Gen. Poe's original project, and an appropriation was made for it, the work to cover a period of about three seasons.

Col. Chas. E. L. B. Davis, the United States engineer in charge, is very much interested in this matter, and is using a great deal of energy in pushing the matter along. The present canal above the locks is 108 ft. in width. The new canal now being built will be the same width, thus doubling the capacity of the present canal when completed.

In order to interfere as little as possible with navigation during the progress of the work, it was deemed best to surround the entire area of the present work with a coffer-dam and make the excavation in the dry, the rock sides of the canal to be made smooth by channeling machines, and all loose material to be removed from the bottom of the canal. The coffer-dam has now been completed, and they are now ready to commence excavating early in the spring, and it will take two more seasons to complete the work.

The Chandler-Dunbar Water Power Co. of Sault Ste. Marie, claim to own islands Nos. 1 and 2 in St. Mary's river, which are directly opposite or in front of the territory in which the government is now working. They (the Chandler-Dunbar Co.) were advised by their counsel that they had a right to take possession, and submitted a brief which is on file in the United States engineers' office. The United States government claim ownership of these islands. The Water Power Co., reluctant to get into a fight with the government, offers to cede to the United States a long strip of land needed for the present canal widening, in exchange for islands Nos. 1 and 2 and Portage street. Portage street was abandoned as a street by the city when the canal was built, and it is still a question whether it belongs to the city of Sault Ste. Marie, the state of Michigan, the United States or the owners of the adjoining land (the Chandler-Dunbar Water Power Co.) The street is not in litigation, but the company desire that the government relinquish all claim to it. These offers of the Chandler-Dunbar Co. were made in 1901 and 1902.

The secretary of the interior, by letter of Oct. 20, 1902, to the secretary of war, stated that his department had this case and similar ones pending for disposition, that the whole matter was then under immediate consideration with a view to early settlement. Jan. 21, 1903, the secretary of the interior instructed the attorney-general to institute judicial proceedings in behalf of the United States to determine the question of title to the islands, and since then but slow progress has been made, but the United States district attorney at Grand Rapids advises me that the case is on the docket to be tried early in March, and Mr. Duane Fox, representing the attorney general, and who has been specially detailed to assist the United States district attorney in this case, feels confident that the government will succeed in establishing its title.

The steamship Columbia, engaged in halibut fishing, struck a rock off the northern coast of Vancouver island on Jan. 9, and sank in half an hour. Her crew was brought to Vancouver on Jan. 13 by the steamer New England. The Columbia was 128 ft. long and valued at \$50,000.

IMPROVING B. & O. TERMINALS ON LAKE ERIE

The Baltimore & Ohio railroad has almost completed the extensive improvements to the Cleveland division, which practically involved the rebuilding of the southern portion of the old Cleveland, Lorain & Wheeling line, straightening the alignment, reducing grades and changing from single to double track. This work has been in progress about eighteen months and it is expected to be finished and ready for through operation by March 1. The total expenditure will amount to about \$4,000,000 and will put the Cleveland, Lorain & Wheeling line in first class condition to handle traffic at an economical cost. The maximum grade on the division will be 15.8-10 ft. to the mile northbound and 26½ ft. southbound.

To make a connection with the main line of the Baltimore & Ohio at Benwood, W. Va., it was necessary to build a line a distance of about a mile from the end of the bridge across the Ohio river at Bellaire, to come to grade with the Cleveland, Lorain & Wheeling, the old line of which terminated considerably below the bridge tracks. Steel viaducts were erected over the streets of Bellaire and across the Cleveland, Lorain & Wheeling yards. The Ohio river bridge had to be entirely rebuilt to strengthen it to carry the heaviest engine. This improvement permits a direct movement of trains going west with the Cleveland division. Trains can go from Wheeling and the Fairmont, W. Va., coal region on to Benwood junction across the Ohio river, down over the new line to the Cleveland, Lorain & Wheeling and on to Cleveland, Fairport and Lorain, or cut over the Central Ohio road to Zanesville without change.

The most important work done on the Cleveland, Lorain & Wheeling, was the construction of the new cut off line between Bridgeport and Flushing, the latter point being about 3½ miles south of Holloway, O. Nearly all of it is new road and for it new right of way had to be purchased to straighten the line and take out the curves. As it is double tracked practically a new tunnel had to be built at Flushing, the old one being single track and having a rather heavy grade in it. Only a small portion of the old tunnel could be used. This big piece of work was completed several weeks ago. All the track between Bridgeport and Flushing is laid with 85-lb. rails in place of the old 70-lb. rails.

A new division terminal has been established at Holloway where the most modern facilities have been provided for handling the business. There the Cleveland division and the Wheeling division meet and train crews are run from there north and south. The terminal improvements consist of a large freight yard, classification yard, machine shop, round-house, turntable, water tank, ash pit and a large reservoir for storage of water. The reservoir will supply the engines with water and prevent a famine during dry seasons.

Another important piece of work is between Chippewa lake and Lester. This is known as the Medina cut-off and consists of about ten miles of new track. It shortens the old line by about 3 miles. This work has just been finished. From Navarre to Columbia, the line has also been somewhat shortened. This is known as the Pigeon Run cut-off.

The channel of Stillwater creek was changed to eliminate bridges at Freeport and a long passing siding was put in at Piedmont. The grade was reduced and additional track laid between Ulrichsville and Canal Dover. The grade has also been reduced at Justus.

Large improvements have also been made to the terminals at Lorain, on Lake Erie, to meet the requirements of the increased volume of business. The most important is a new coal dock that was completed a few weeks ago and is now in use. The dock is 700 ft. long and equipped with the most modern facilities for transferring coal from cars to vessels. These include a Jeffrey conveyor, telescopic chute and chute tower and engine and a boiler. New track was laid and con-

siderable dredging done to enable the vessels to get up to the dock. A portion of the property purchased by the Baltimore & Ohio over a year ago at a cost of \$130,000, was used for the dock improvements. About \$90,000 was expended in constructing the dock. In addition to this work new machinery was installed in the machine shops, where repairs are made to locomotives and freight cars. The old buildings were destroyed by fire in December, 1903, and since then the shop for repairing passenger cars has not been rebuilt. The yard has also been considerably enlarged and additional tracks laid to facilitate the handling of traffic.

When the big improvements on the Cleveland division were started the old Cleveland, Lorain & Wheeling line was very crooked and in bad condition. In practically rebuilding the line it was necessary to detour it at a number of places for the purpose of cutting down grades and lessening the curvature. This work, with the new terminals at Holloway and the improvements at Lorain, places the division in first class shape for operation. It gives the Baltimore & Ohio a low grade line to the great lakes that permits of prompt and easy movement of the large volume of coal from West Virginia points.

It is this character of improvements that has built up the entire system of the Baltimore & Ohio railroad and made it one of the best in the country.

MASTERS AND OWNERS DRAWING CLOSE TOGETHER

The grand lodge of the Ship Masters' Association is now in session in Cleveland. Whatever business they may do in executive sessions during the week will be unimportant in comparison with what occurred at the opening session on Wednesday afternoon. This is no more nor less than a determination to admit the owners of vessels as honorary members of the association. It means that the owner and master are to be united in a closer bond in the future than they have been in the past. The desire to bring this about has been noted for several months past and has been especially referred to by Mr. Henry Coulby, president and general manager of the Pittsburg Steamship Co., on various occasions. In fact, at the annual meeting of the Lake Carriers' Association in Detroit, Mr. Coulby suggested the advisability of inviting captains to have a share at least in the social doings of that body. For the past two or three years conditions have tended to deprive the master of considerable of his authority on board ship and to make him less close to the owner than was his wont to be. Various appointments were dictated from the home office and, in a particular instance, orders were issued to certain departments of the ship of which the captain had absolutely no knowledge. The masters felt this situation rather keenly and it doubtless has a tendency to solidify them as an organization. The restlessness and dissatisfaction culminated in the strike of the Masters and Pilots' Association last year and while the major portion of the masters doubtless regretted the circumstance they thought that they could not withdraw from that association under fire. Capitulation was finally made, however, and the masters returned to the vessels. The Masters and Pilots' Association as far as the great lakes is concerned was dismembered altogether.

Both sides drew lessons from that struggle. Both sides spontaneously felt that they should be closer together and there has been considerable discussion along that line privately during the past few months. On Wednesday afternoon the grand lodge of the Ship Masters' Association invited ship masters generally to attend an open meeting and also sent invitations to vessel owners. Among the vessel owners present were Harry Coulby, W. P. Murray of Pickands, Mather & Co., Mr. Teare of Potter, Teare & Co., Mr. T. F. Newman of the Cleveland & Buffalo Transit Co., Mr. J. W.

Wardwell of the Great Lakes Towing Co., Mr. J. H. Sheadle, vice president of the Lake Carriers' Association and Mr. Arthur Hawgood. All of them spoke and they spoke right to the point. They believed that the vessel owners should be made members of the Ship Masters' Association and assured the masters that what the owners most desired was the perpetuity of the Ship Masters' Association wherein both owners and masters could discuss the problems of the trade as they arose from day to day. Formerly this was done but latterly it had not been observed as well as might be. An inspection of the constitution of the Ship Masters' Association shows that the grand lodge possessed sufficient authority to admit the owners as honorary members and this course will probably be taken before the grand lodge adjourns this week. Addresses in favor of it were made by Capt. C. E. Benham, past president; Capt. H. H. Parsons of Detroit, grand president; Mr. James A. Calbick of Chicago, W. D. Ames of Cleveland and a number of others. No movement which has been lately projected on the lakes has greater potentiality than this.

FORECAST OF LAKE TRADE

The old saying that a prophet is not without honor save in his own country might be well paraphrased to say that a prophet is not without honor save in the ore business. The wisest men in that trade are frequently the wildest in their predictions. As a rule, however, predictions concerning the movement of ore fall short of the actual figure. The lake trade has a habit of making jumps that no one can either foretell or foresee. Ore is selling so lively, however, that some of the largest concerns have practically no unsold ore on dock and have sold very large amounts for 1905 delivery. In fact, it would not be surprising if the big shippers would have sold within the next two or three weeks all that they care to promise to deliver during the season of 1905. The conservative members of the trade are predicting a movement of 28,000,000 tons during the coming season and a few place the figure as high as 30,000,000 tons.

Undoubtedly the vessel capacity can readily handle even more than 30,000,000 tons. In 1902 27,500,000 tons were handled in a season during which dispatch was the poorest ever known and it was estimated that with normal dispatch the fleet then in existence could have readily handled 35,000,000 tons. Since then the carrying capacity of the ore fleet has been greatly enlarged and during the coming season will be amplified by the largest carriers ever constructed on the lakes. While the movement of ore during 1904 was light in the aggregate it was month by month the heaviest on record. During August, September and October the movement was considerably over 4,000,000 tons per month, which would be well over 30,000,000 for an average season. There was no special difficulty in handling this flow of ore at the receiving docks, the delays during 1904 being unimportant. These figures supply the argument of the shippers that the trade does not justify a better freight rate than that which obtained last year. Vessel owners on the other hand contend that it does and also point to the fact that ore prices are ruling 50 cents higher than they were last year and that therefore vessels should share in the general increase in profit. Sentiment does not cut much figure in business, however, and undoubtedly the rate will be determined by the question of supply and demand. The season will undoubtedly be a very busy one and its blessings be widely disseminated through a hundred industries which depend upon it.

A revision in colors of chart of Copper harbor has been issued by the United States lake survey office and is now for sale by the Marine Review.

LAUNCH OF THE FRANCIS L. ROBBINS



MISS ZULEIKA BECKER

The steamer Francis L. Robbins named in honor of the president of the Pittsburg Coal Co. was launched from the Cleveland yard of the American Ship Building Co. on Thursday last. The Robbins was christened by Miss Zuleika Becker, daughter of Mr. W. H. Becker, president and manager of the Robbins Trans-

portation Co., which will operate the steamer. The Robbins is 400 ft. over all, 380 ft. keel, 50 ft. beam and 28 ft. deep. The engine of the steamer George W. Roby will be installed in the new boat. This engine is of a triple-expansion type with cylinders 19, 30 and 52 in. diameter by a stroke of 4 in. supplied with steam from two Scotch boilers, 12 ft. in diameter and 12 ft. long, allowed 175 lbs. pressure. The Robbins will have twenty hatches and will have a carrying capacity of 6,000 tons of ore. The launch of the vessel was most suc-

D. H. LYMAN
Lord High Executioner.

cessful and was witnessed by a large crowd. The guests were: Mr. Francis L. Robbins of Pittsburg; Mr. and Mrs. W. H. Becker, Wm. Becker, Mr. and Mrs. John A. Donaldson, Mr. Martin Mullen, Mr. J. P. Walsh, Mr. Robt. Wallace, Mr. Jas. C. Wallace, Mr. and Mrs. Robt. Logan, Miss Hilda Logan, Mr. W. A. Hawgood, Mr. H. A. Hawgood, Mr. John F. Wedow, Mr. and Mrs. Frank Seither, Capt. and Mrs. R. W. England, Mr. and Mrs.

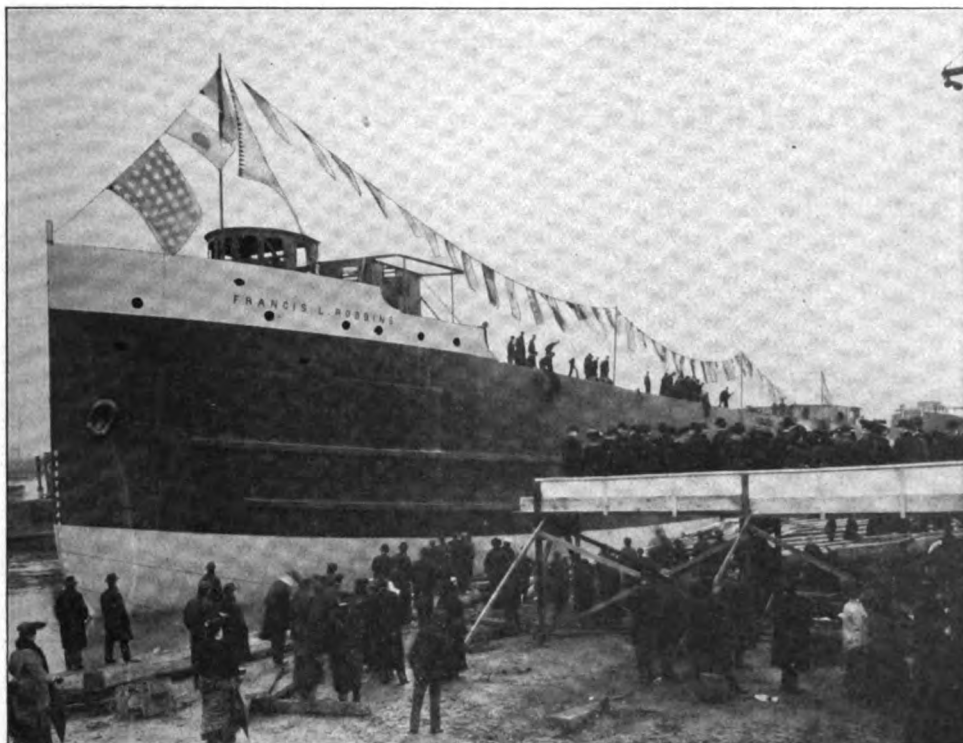
E. R. Danow, Mr. and Mrs. E. P. Church, Mr. and Mrs. F. H. Marks, Mr. and Mrs. C. A. Williams, Mr. and Mrs. Wm. Gibson, Mr. Francis Widlar, Mr. C. O. Jenkins, Mr. A. E. Williams, Capt. C. L. Hutchinson, Mr. Fred Steinen, Mr. Fred McCracken, Capt. Henry Stone and Mr. Harry Reynolds, all of Cleveland; Mr. W. I. Babcock of New York; Mr. Edward Smith of Buffalo, Mr. and Mrs. Earl Crawford of Menominee, Mich.; Mr. E. T. Loundon, Mr. J. W. McDonald and Mr. George W. Schuterberg of Pittsburg.

PERSONAL

C. H. McCullough, second vice president of the Illinois Steel Co. and executive officer of the United States Steel Corporation for its western mills, has tendered his resignation to become assistant to President Clark of the Lackawanna Steel Co.

Com'dr Charles Laird who has been in command of the gunboat Michigan since February of last year has been detached from the Michigan in order to take charge of the Norfolk as equipment officer. Com'dr Morrell will succeed to the command of the Michigan.

Capt. C. H. Sinclair has resigned as general manager of the Great Lakes Towing Co. to take effect Feb. 1. Capt. Sinclair



THE ROBBINS SAFELY IN THE WATER

has made no announcement of his plans for the future but as he has had vast experience as a wrecker it is believed that he intends to engage in that business.

Mr. H. A. Barr, who was the general agent for the Northwestern Railway Co. at Escanaba, has retired. Mr. Barr has been connected with the Northwestern railway for forty-one years and the officials of the company gave a banquet in his honor at Escanaba on Saturday evening last. Mr. W. F. Look, who has been the dock agent at Escanaba, has succeeded Mr. Barr.

Mr. W. J. Olcott, general manager of the Oliver Iron Mining Co., the mining end of the United States Steel Corporation, has been elected vice president to succeed Dr. Nelson P. Hulst who retired Jan. 1. L. W. Powell, assistant to President T. F. Cole, has been made assistant manager. Mr. Olcott will continue to perform the duties of general manager in connection with his office of vice president.

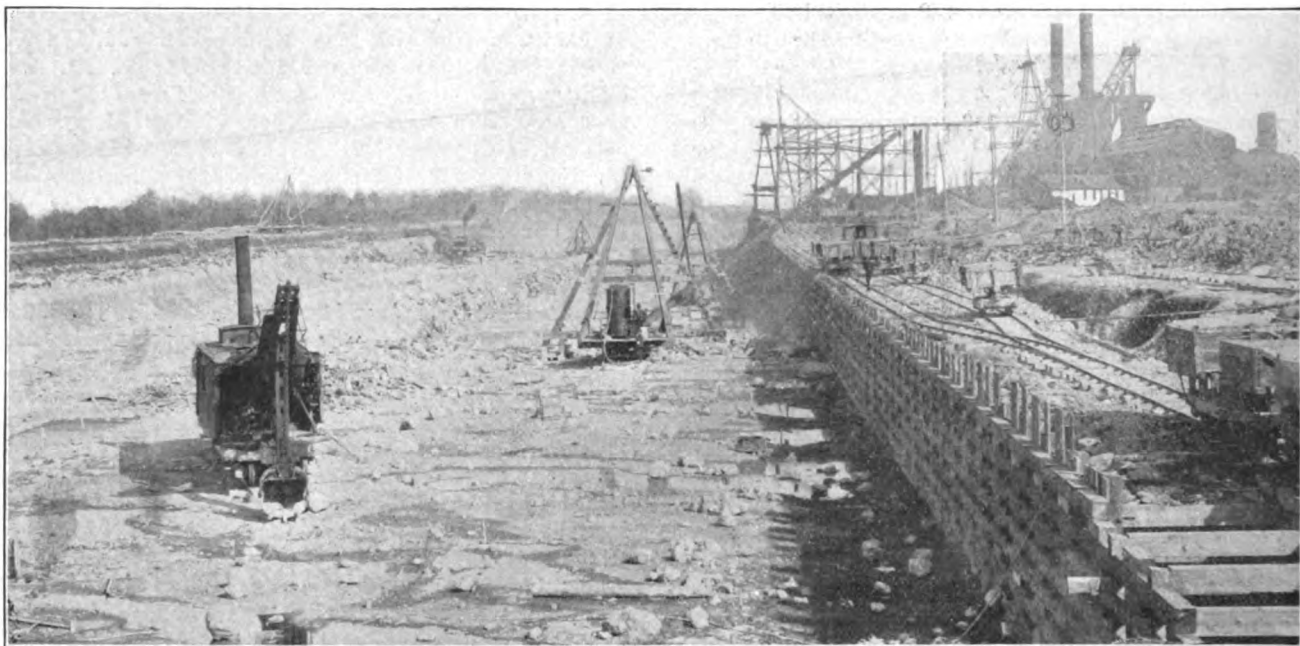


FIG. 2.—GENERAL VIEW, ILLUSTRATING METHODS OF OPERATION.

Buffalo & Susquehanna Iron Co.'s Canal

The completion of the great breakwater in Lake Erie at Buffalo, N. Y., has rendered it possible to use the lands along the lake front for four miles south of the Buffalo river harbor entrance as far as Stony Point for commercial and manufacturing purposes. This breakwater, designed by and built under the direction of Col. T. W. Symons, of the U. S. Corps of Engineers, was begun in 1896 and completed in 1903.

At the extreme southern end of the outer harbor enclosed on the lake side by this breakwater is situated the immense new plant of the Lackawanna Steel Co., on the construction and development of which about \$40,000,000 has been and is being expended. Adjoining the Lackawanna steel plant property on the north is the property owned by the Buffalo & Susquehanna Iron Co. and the Buffalo & Susquehanna Railway Co., which property with a general average width of about 800 ft. extends inland from the lake nearly one mile. To the north of this property is a large tract belonging to the Pennsylvania Railroad, and upon which this company designs to erect its immense Buffalo freight terminals.

With great wisdom these three companies, Buffalo & Susquehanna Iron Co., Buffalo & Susquehanna Railway and Pennsylvania Railroad, have joined in the enterprise of building

a ship canal leading in from the lake for their mutual use and the commercial development of their properties. The canal starts at the established harbor line in the outer harbor and has a total length of 4,000 ft. It is to be 200 ft. wide with its center line on the boundary between the Buffalo & Susquehanna and Pennsylvania railroad properties. When completed its depth will be 23 ft. at mean lake level, which is calculated to be sufficient to float the largest loaded lake vessels under all conditions of wind and weather.

The outer half of the Buffalo & Susquehanna tract and canal is to be used for the freight terminals of the Buffalo & Susquehanna railway for docks, coal pockets, lumber yards, elevators, warehouses, etc. The extreme outer portion or the area between the old lake shore and the harbor line has been enclosed by a substantial dock partially of pile work and partially of crib work and will be filled to a grade of 8 ft. above mean lake levels.

Upon the inner half of the tract are situated the furnaces of the Buffalo & Susquehanna Iron Co. and the canal in front thereof to which this article particularly refers. The land of the Buffalo & Susquehanna Iron Co. is of marshy character with its surface but about two feet above

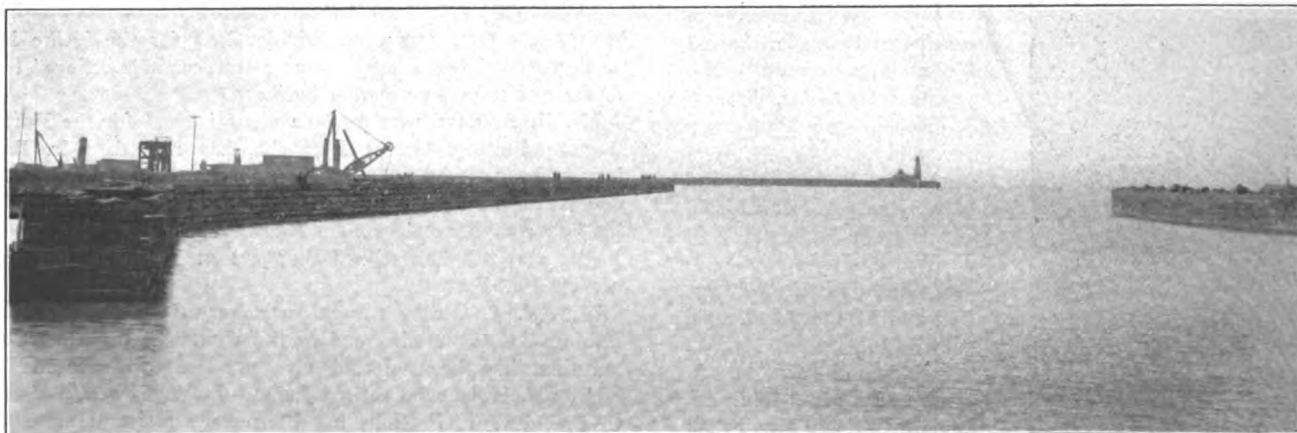


FIG. 3.—ENTRANCE AND APPROACH TO CANAL FROM LAKE ERIE.

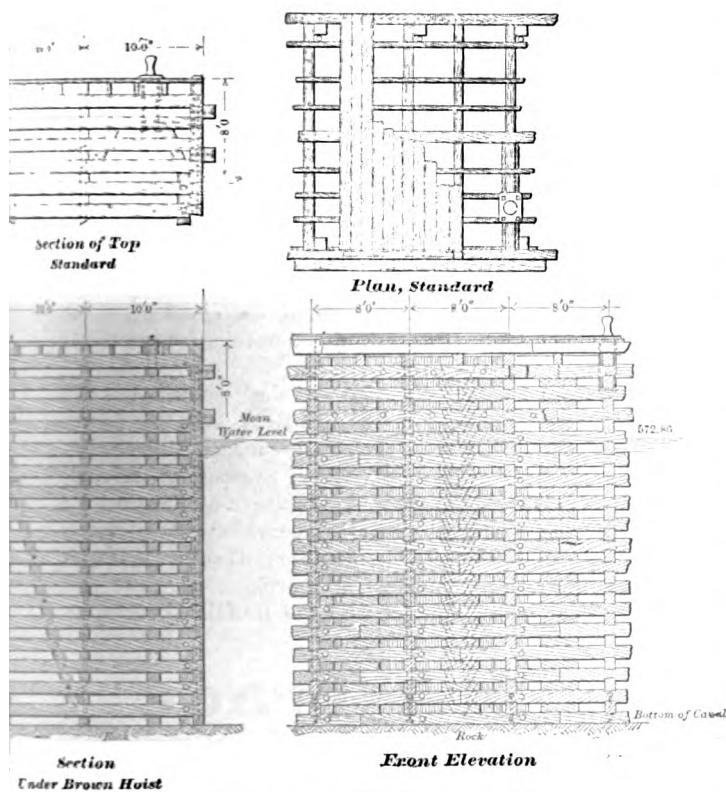


FIG. 4.—DETAILS OF DOCK CONSTRUCTION.

mean lake level. The top soil is a peaty marsh deposit averaging some four or five feet thick. Below these deposits the material is clay to the underlying rock which has an elevation varying from 20 to 30 ft. below mean lake level. The rock is Niagara shale.

The furnaces are built parallel with the canal and about 300 ft. therefrom. Between the canal and the furnaces is the ore yard to be covered and commanded by Brown hoists, electric man trollies, with 5-ton grab buckets similar to those on

the Carnegie dock at Conneaut. The canal is cut through the material above briefly described. Along the property of the iron company the rock, by a rather remarkable and fortunate coincidence, lies at an average depth, almost exactly corresponding with the projected bottom of the canal. At the western end of the property there is a rock cut of about four feet which at the eastern end the rock dips below canal bottom about four to five feet.

To outline and limit the canal, retain the soft material and furnish a wharf for shipping to lie at unloading ore, etc., and for ordinary commercial purposes a crib dock is being built and is nearly completed along the entire canal front of the iron company.

This crib dock is 20 ft. wide and is founded directly on the bed rock where this is at or above a level of two feet below canal bottom. Where the depth of rock is greater it is cleaned of all soft material and a bed of concrete put in somewhat wider than the crib and to an elevation of 2 ft. below canal bottom. To overcome the tendency of the concrete to slip on the more or less greasy bed rock under the pressure of the earth backing iron bolts 2 in. in diameter are sunk into the rock and project up into the concrete.

The crib dock as built is shown on the line drawing Fig. 4. It is an open work structure of hemlock below the water line and yellow pine and oak above and all filled with the rock excavated from the canal. Along in front of the ore yard the dock will carry the front leg of the Brown hoists and this portion of the dock is strengthened to provide for this load. To hold the dock against slipping on the bed rock heavy old car axles are imbedded in the rock and project up just in front of either the front or rear walls of the cribs. The cribs are also tied back by heavy iron rods either to anchor piles specially driven or to the piles supporting the concrete ore yard.

Fig. 1 herewith gives a front view of the dock and a general view of a portion of the furnaces and of one of the Brown hoists which span the ore yard in process of erection. The portion of the canal shown in the photograph is excavated to its ultimate depth. The bottom is rock and it is seen how the rock beneath the cribs and above canal bottom diminishes

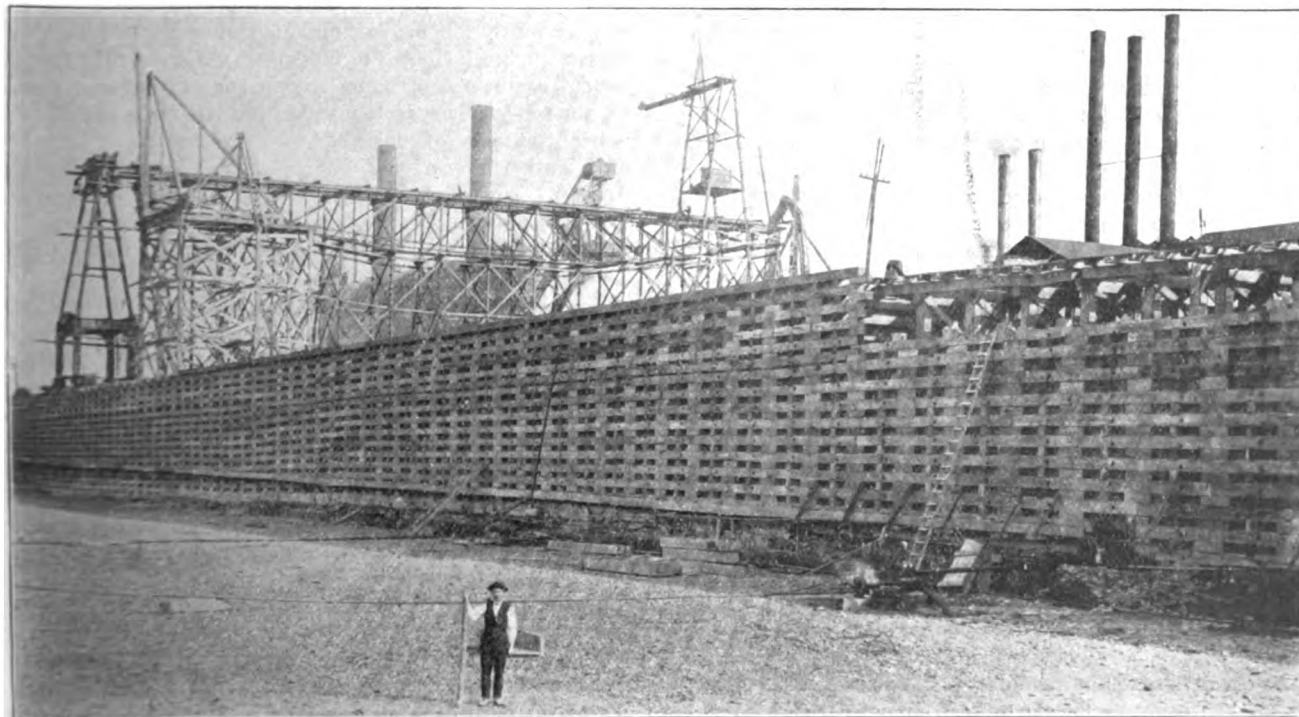


FIG. 1.—FRONT VIEW OF DOCK, SHOWING ALSO FURNACES AND BROWN HOIST. CRIB WORK 31 FT. HIGH.

in thickness from right to left. The total height of the crib work shown is 31 ft.

Fig. 2 is a more general view and shows some of the methods of operation. The derrick in the upper left hand corner is operating an orange peel clam dredge for the removal of the peaty mass on top of the canal area. The steam shovel just below it with a train of cars alongside is removing the clay to the rock. In the extreme foreground the rock has been drilled as indicated by the wooden plugs in the drill holes but has not yet been blasted. The long arm derrick in the center of the view is on canal bottom working toward the front of the picture and is lifting the blasted and broken rock into cars on top of the yet uncompleted portion of the crib dock. From there the rock is taken to fill in the cribs and the excavated space of the cribs. In the right hand upper corner are the furnaces of the iron company.

Just inside the shore line the canal is crossed by the Hamburg turnpike, a highway of considerable importance. To provide for this crossing a Scherzer rolling lift bridge will be built with a clear span of 80 ft. This will be operated by electricity furnished by the iron company. A temporary crossing of the canal is now effected on the dam which separates

the "wet" work in the lake from the "dry" work of construction inside the lake shore.

The view in Fig. 3 is taken from this canal dam and shows the entrance and approach to the canal from Lake Erie. To the left of the picture is the crib and pile dock of the Buffalo & Susquehanna Railway Co., on the south side of the canal; to the right, the crib dock of the Pennsylvania Railroad on the north side of the canal, while in the distance is the main Government breakwater. The opening through this breakwater for the passage of ships is 600 ft. wide and is indicated in the picture by the two lighthouses, the main flash-light with fog signals to the south of the opening and the smaller guide light at the north of the opening shown on the extreme right of the picture.

The work of building the canal and dock described as well as its furnaces has been in the hands of Wm. A. Rogers, president, and Hugh Kennedy, general manager of the Buffalo & Susquehanna Iron Co. Col. T. W. Symons, of the Army Engineer Corps, was the designing engineer of the canal and docks and has exercised general supervision over them as consulting engineer since their inception. George O. Wagner has been the resident engineer in charge. The entire work has been done under contract with the Buffalo Dredging Co.

Growth of the Iron Ore Trade

Accompanying this issue of the Review is a tabulated supplement compiled by the Iron Trade Review showing the shipments from all the Lake Superior mines since the discovery of iron ore in 1844. The shipments by lake during 1904 were 21,226,664 tons to which must be added a rail movement to upper lake furnaces and to South Chicago and Milwaukee of 596,175 tons, making total shipments of 21,822,839 gross tons compared with 24,289,878 tons in 1902, 20,593,537 tons in 1901 and 19,050,303 tons in 1900. The all-rail movement was 640,328 tons in 1903 and 531,952 tons in 1902. The total shipments for 1904 as given above does not include 77,390 tons shipped from the Helen mine of the Michipicoten range. Owing to financial troubles the shipments from the Michipicoten range were not as large as in 1903 when 293,419 tons were shipped.

With the shipments of 1904 the Mesabi range outstrips all of the ranges including the old Marquette in actual shipments. This range was discovered thirteen years ago but it is the giant of all the ranges. Mining in various parts of it is merely the simple process of shoveling and it therefore renders itself naturally to a prodigious output. The shipment of the ranges to date are: Mesabi 78,790,357 tons, Vermillion 22,020,718 tons, Gogebic 43,129,473 tons, Menominee 49,071,986 tons, Marquette 72,590,112 tons, a grand total of 265,666,359 tons.

Indeed the importance of the Mesabi range is emphasized by the figures of 1904. Its shipments were 12,156,008 tons, while this was exceeded in 1902 and 1903 which showed 13,342,840 tons and 12,892,540 tons respectively, the Mesabi percentage reached high point in 1904, being 55.7 per cent against 48 per cent in 1902 and 53 per cent in 1903. Evidently Mesabi is destined to contribute in the future an increasing percentage as well as an increasing tonnage as is exemplified by the fact that the United States Steel Corporation drew on the Mesabi range last year for 58 per cent of its shipments against 56 per cent in 1903 and 50 per cent in 1902. The Steel Corporation's Mesabi's shipments are a larger portion of its total than are all Mesabi shipments of the total from the region.

The Steel Corporation's shipments last year were 11,197,743 tons or 51.3 per cent for the whole. In 1903 it shipped 13,485,597 tons or 55.5 per cent of the whole; in 1902 it shipped

16,136,787 tons or 58.5 per cent of the whole. The 1902 movement was, as is well known, an abnormal one and was evidently caused by the policy of the Steel Corporation to have an abundant surplus on lower lake docks.

In fact the Steel Corporation's shipments of Lake Superior ores are not an accurate index of its consumption year by year. There are deductions to be made on account of ore shipped to other consumers and there are additions to be made of ore which the Steel Corporation receives from other producers. The corporation takes not only the Carnegie Steel Co.'s original share of the Pewabic output which it had as half owner of that property, but it is the purchaser of the remaining half each year. It also receives one-fourth of the Pewabic ore through the quarter interests of the National Steel Co. and in addition half the ore of the Union mine and one-fifth the ore of the Mahoning mine through the American Steel Hoop Co. holdings. On the other hand the output of the Adams mine largely goes to other consumers on the ten-year contracts made in the late '90's and there are other contracts of subsidiary companies which the Steel Corporation is carrying out by annual regular shipments from its mines. In some cases the corporation as lessee, pays royalty which comes to it in turn as fee owner, this relation being sustained originally by companies that are now constituents.

The list of shipping mines in 1904 contains 135 names, against 142 in 1903, 133 in 1902 and 104 in 1901. The distribution among the ranges is as follows: Marquette range, 20, against 22 in 1903; Menominee, 30, against 33; Gogebic 22, against 28; Vermillion, 6, the same as in 1903 (though in the latter year Sibley and Savoy were reported as one); Mesabi, 55, against 53. There are several names that stand for more than one mine. The Cleveland-Cliffs-Iron Co.'s Marquette range product is all under one head, except the ore from the Negaunee mine. The Hull, Burt and Rust mines, on the Mesabi range are reported as Lake Superior group. On the Gogebic range the Norrie, East Norrie and Pabst are reported as one.

The Stevenson mine stands pre-eminent in the producing column of 1904, with a total of 1,652,021 tons. This record has been exceeded twice in the history of Lake Superior iron ore production, both times by the Fayal mine, its pro-

duction in 1902 being 1,919,172 tons and in 1901, 1,656,973 tons.

Following is a table of shipments since the Sault Ste. Marie canal was first opened in 1855:

Year.	Total shipments.	Year.	Total shipments.
1855	1,449	1880	1,998,745
1856	30,343	1881	2,307,005
1857	25,049	1882	2,605,412
1858	15,876	1883	2,352,840
1859	68,832	1884	2,518,093
1860	114,401	1885	2,466,642
1861	49,009	1886	3,505,144
1862	124,169	1887	4,762,107
1863	203,055	1888	5,003,877
1864	243,127	1889	7,292,643
1865	230,208	1890	9,003,725
1866	278,796	1891	7,071,053
1867	473,507	1892	9,072,241
1868	491,449	1893	6,005,716
1869	617,444	1894	7,748,312
1870	830,940	1895	10,429,037
1871	779,007	1896	9,934,828
1872	900,901	1897	12,404,574
1873	1,162,458	1898	14,024,673
1874	910,557	1899	18,251,804
1875	891,257	1900	19,059,303
1876	992,764	1901	20,593,537
1877	1,015,087	1902	27,571,121
1878	1,111,100	1903	24,280,878
1879	1,375,691	1904	21,822,839

In the following tables the shipments are given by ranges and by ports and all-rail:

SHIPMENTS BY PORTS AND ALL-RAIL, GROSS TONS.

	1904	1903	1902	1901
Eschsch	3,644,297	4,277,561	5,413,704	4,022,668
Marquette	1,007,301	2,007,346	2,505,010	2,354,284
Ashtab	2,288,400	2,823,119	3,553,919	2,886,252
Lake Harbors	4,566,542	5,120,656	5,605,185	5,018,107
Gladstone	553	85,816	92,375	117,089
Superior	4,160,000	3,978,579	4,180,568	2,321,077
Duluth	4,649,611	5,356,473	5,598,408	3,437,955
Total by lake	21,226,004	23,649,559	27,030,169	20,157,522
Total by rail	506,175	640,328	531,952	436,015
Total shipments	21,822,839	24,280,878	27,571,121	20,593,537

SHIPMENTS BY RANGES, GROSS TONS.

	1904	1903	1902	1901
Marquette Range	2,843,703	3,040,245	3,868,025	3,245,346
Superior Range	3,074,848	3,749,507	4,612,509	3,619,083
Ashtab Range	2,398,287	2,912,012	3,663,484	2,938,155
Vermillion Range	1,282,513	1,676,009	2,084,203	1,786,063
Marquette Range	12,156,608	12,892,542	13,342,840	9,604,890
Miscellaneous	67,480	17,913		
Total	21,822,839	24,280,878	27,571,121	20,593,537

GOGEIC RANGE.

	Gross tons.	Mine.	Gross tons.
Marquette	45,505	Mikado	25,611
Ashtab	344,101	Montreal	163,021
Superior	77,224	Newport	171,931
Marquette	212,020	Norrie group	618,638
Superior	84,870	Ottawa	30,420
Marquette	61,860	Palms	53,718
Superior	81,141	Puritan	1,259
Marquette	23,394	Sunday Lake	50,625
Superior	23,197	Tilden	204,581
Marquette	6,538	Wisconsin	11,225
Superior	59,587	Yale	46,800
Total			2,308,287

VERMILLION RANGE.

	Gross tons.	Mine.	Gross tons.
Marquette	422,162	Savoy	74,806
Superior	70,713	Sibley	122,783
Marquette	595,432	Zenith	86,557
Total			1,282,513

MARQUETTE RANGE.

Mine.	Gross tons.	Mine.	Gross tons.
Beaufort	25,781	Lake Superior	590,339
Breitung	9,800	Lille	63,209
Cambria	84,852	Mary Charlotte	48,885
Champion	174	Moore	25,828
Cleveland-Cliffs	743,293	Negaunee	145,132
East New York	7,299	Princeton	70,461
Foxdale	3,429	Queen	311,479
Hartford	179,980	Republic	124,500
Imperial	727	Richmond	68,134
Lake Angeline	262,486	Volunteer	71,870
Total			2,843,703

MENOMINEE RANGE.

Mine.	Gross tons.	Mine.	Gross tons.
Antoine	81,164	Hiawatha	38,288
Aragon	374,944	Lamot	29,393
Armenia	10,577	Lincoln	17,577
Baltic	151,114	Loretto	54,720
Bristol	132,420	Mansfield	79,163
Caspian	4,242	Munro	32,332
Chapin	541,324	Nanaimo	9,086
Commonwealth	1,617	Paint River	11,257
Crystal Falls	189,983	Penn Iron Mfg Co.	141,948
Florence	153,452	Pewabic	372,791
Forest	11,988	Quinnesec	33
Genesee	132,380	Riverton	81,543
Great Western	68,318	Tobin	113,600
Groveland	4,737	Verona	20,202
Hemlock	136,232	Vivian	81,354
Total			3,074,848

MESABI RANGE.

Mine.	Gross tons.	Mine.	Gross tons.
Adams	940,105	LaBelle	80,554
Agnew	96,435	Lake Sup. Group	1,415,884
Albany	153,433	LaRue	105,170
Bessemer	86,393	Laura	3,778
Biwabik	647,614	Leetonia	228,536
Cass	29,554	Leonard	151,952
Chisholm	139,732	Lincoln	153,822
Clark	256,873	Longyear	221
Commodore	240	Mahoning	706,325
Corsica	30,131	Malta	60,641
Croxton	348	Minorca	121,739
Cyprus	244,343	Morrow	33,012
Day	84,530	Mountain Iron	1,168,855
Duluth	149,819	Oliver	5,395
Elba	123,425	Pearce	235
Fayal	975,102	Petit	27,088
Forest	85,280	Scranton	1,168
Franklin	65,528	Sellers	207,900
Frantz	62,884	Shenango	51,712
Genoa	244,150	Sparta	50,602
Glen	280,412	Spruce	580,319
Grant	44,413	St. Clair	20,748
Hawkins	90,055	Stevenson	1,652,021
Higgins	35,280	Troy	12,759
Iroquois	50,215	Utica	120,607
Jordan	97,474	Winnifred	81,686
Kanawha	912	Yates	53,179
Kinney	6,225		
Total			12,156,008

MISCELLANEOUS.

Mine.	Gross tons.	Mine.	Gross tons.
Illinois (Baraboo Dist.)	47,922	Iron Ridge	19,558
Total			67,480
Grand Total	21,822,839 tons.		

The lake cruiser Canada will shortly leave on a winter training cruise to the West Indies with a crew of seventy-five drawn from the fishermen of the maritime provinces. After leaving Halifax the steamer will touch at the Bermudas, Nassau, Port Royal, Jamaica, Barbadoes, Port of Spain, Turk's island, arriving back at Halifax in April ready for inspection service during the coming season. The route covered will be 6,700 miles.

WILL GLADLY VOTE FOR IT

Editor Marine Review: I am very much obliged to you for your letter of Jan. 17 and the enclosure on the ship subsidy bill now before congress is of greatest interest to me, and in fact I regard it as the most important legislation we have before the country today. While I am not in harmony with the plan upon which this subsidy is based in this bill, nevertheless, I shall gladly vote for it rather than be a party to further delay, for I regard non-action worse than any policy that has been suggested. In the consideration of this subject, I find six important lines of benefit to the United States, which in the aggregate would seem to make it imperative that we at once take up the subject with the determination to restore the American ocean marine against any and all opposition whatever. These benefits are as follows:

First—The payment to our own ships and the retention in our own country of one-half of the freight money paid out for foreign freights, \$100,000,000 (total paid out for foreign freights being about \$200,000,000). We are by right entitled to over one-half of this freight, for the reason that, while we are entitled to one-half the carriage with nations that have a merchant marine, we are entitled to the whole of the freightage with countries that have no shipping, for instance, the republics of South America, China, Cuba and some others of lesser importance.

Second—The great ship building industry which would come to us in the building of shipping needed.

Third—The extension of our commerce, and I regard this benefit to our country as great as either of the two preceding. We should have at least four times the trade with South America which we are having today, when we have ships of our own plying directly between American and South American ports. I regard South America as the legitimate ground for increased trade which our country is demanding and requires, and there is no reason why we should not obtain it other than the lack of American shipping.

Fourth—The training of a large class of American seamen to be available for our navy in case of war, or from which our navy can draw recruits at all times.

Fifth—American ships to be available as a reinforcement or addition absolutely necessary to our navy in case of war.

Sixth—The removal of the danger of annihilation of our commerce should any of the nations having large merchant marines and who are now carrying 91 per cent of our commerce become engaged in war we could not ship our goods in the bottoms of either belligerent nation without danger or certainty of confiscation. The loss involved in the disturbance to our commerce would be many fold greater than any subsidy we would have to pay under any such bill as is proposed.

I had hoped that a subsidy bill would be offered, wherein the subsidy would be based upon actual performance, and by this I mean that there would be a tonnage premium paid for every ton of foreign freight brought in our country. Such tonnage premium should be based upon distance carried. This system would seem to me more equitable, for it would give the same benefit to the small tramp as to the large liner, and to the owner of small means as to the great corporation. I cannot extend my reasons in the short space of this letter, but it seems to me that the basis of actual performance would be a fit basis, and one which would appeal to the American people as being thoroughly honest and free from favoritism.

I cannot consider the plan of discriminating duties suggested by the minority report on this bill as a just and reasonable method, for it would give, as I understand it, to a ship with a cargo subject to high duties a greater benefit, while if the ship carried a class of goods now on the free list it would be discriminated against in favor of the ship carrying the goods subject to the higher duty, and as a consequence the American ships would be looking for the dutiable cargoes and the non-dutiable cargoes would fall to the foreign carriers as heretofore.

It is to be greatly regretted that the American people have become biased against the word "subsidy," regarding it as a synonym for graft or favoritism, whereas, it is simply a means of protection to an industry of greatest importance to the nation, and which has not heretofore received protection, and this protection is needed simply and solely to offset the difference between the cost of labor in foreign countries and our own—laborers in foreign ship yards and seamen receiving much less wages than American laborers receive in our yards and on our ships.

The reasons which I have given herein for my support of any reasonable measure (regardless of whether it coincides with my own views or not) looking to the restoring of our shipping in our foreign trade should, and I hope will, be shared by a majority in congress, to the end that we shall have favorable legislation and that immediately upon this subject. I am,

Very truly yours,

GEO. A. LOUD.

House of Representatives, Washington, D. C., Jan. 19.

MOST VITAL QUESTION NOW BEFORE CONGRESS

Editor Marine Review, Sir: I have received the editorial on the question of upbuilding the merchant marine engaged in the foreign trade. I wish we had more assistance like it. There can be no doubt but what the Review and the business men of Cleveland are doing their full share toward creating a healthful and patriotic sentiment in favor of our merchant marine. If our people fully comprehended the importance of this, the most vital question now before the congress, they would not be satisfied with the United States senate that is now squandering valuable time over matters that are not of great moment, to the exclusion of more important and far-reaching measures, in which the whole industrial fabric of this country in a measure, and I may say in a large measure, depends. The bill reported by the Merchant Marine Commission is a good one. It would, if enacted into law, start us on the road that would lead to a great saving of money now paid to foreign bottoms for carrying of products and people. One hundred and fifty millions of dollars are annually paid to ships of other countries for services that we as a producing country ought to be able to perform ourselves. We must, if we hope to continue the present prosperous conditions, expand and broaden our market for our products. To expand this market we must find consumers abroad, to get our products into the hands of consumers abroad, have more delivery wagons on the road to these consumers. And let me ask what is an American ship with an American crew and flag but a delivery wagon, carrying goods from our great department storehouses.

Yours,

E. S. MINOR.

House of Representatives, Washington, D. C., Jan. 20.

PROMOTE THE BUILDING UP OF OUR MARINE

Editor Marine Review: I am in receipt of yours of the 17th instant and note what you say in relation to the proposed shipping bill. From my first entrance into congress I have done everything in my power to promote the building up of our merchant marine, and I shall be very glad to be put in possession of any facts in support of the measure which would be of service in presenting the matter to the senate. I will greatly appreciate any suggestions you may be able to make or furnish.

J. C. BURROWS.

United States Senate, Washington, D. C., Jan. 20.

WILL PASS IF OPPORTUNITY AFFORDS

Editor Marine Review: I am in receipt of yours of the 17th inst., calling my attention to the shipping bill now pending before congress. This bill has been reported favorably to the

house, but I have not yet had time to examine it. When it is brought up for consideration I shall give it my most careful attention. Ordinarily a bill having the unanimous support of the dominant party on the committee is almost certain of passage. It may be that there will be some endorsements, but the bill in some form, if there is an opportunity for its consideration, will no doubt pass the house.

Yours very truly,

J. A. TAWNEY.

House of Representatives, Washington, D. C., Jan. 20.

HOPES THE BILL WILL PASS

Editor Marine Review: Your letter, enclosing advance proof from Marine Review, received. I think you make a very full and strong presentation of the matter in a very short space. It seems to me that you have completely covered the case. I thank you very much for your courtesy in offering to render me assistance in the way of furnishing facts and information, and will certainly not hesitate to call upon you should I feel the necessity of so doing, at any time. I desire to express to you my sincere thanks for the assistance that you and the Marine Review have furnished to the commission in their work. Trusting that before long we may have a law embodying the terms of the present bill written upon our statute books, I am,

W. E. HUMPHREY.

House of Representatives, Washington, D. C., Jan. 21.

OBITUARY

Sorrow is expressed throughout the engineering world over the death of Mr. Beauchamp Tower. Mr. Tower began his engineering career as a pupil at the Elswick Works, England, in 1861, and after the completion of his four years' pupilage remained at the works as draughtsman for a few months, leaving in April, 1866, to take charge of the construction of a number of iron steamers at the Tyne Iron Works, where he remained till 1868. In 1869 he commenced, as assistant to the late Mr. W. Froude, F. R. S., the course of experimental research for which he had such undoubted talents, and on which his permanent fame will mainly rest. He worked with Mr. Froude till June, 1872. In addition to his official employment during the day, Mr. Beauchamp Tower also worked extremely hard at schemes of his own during his leisure, and the consequence was that his health gave way under the strain, necessitating a year's trip in a sailing vessel to the South Sea Islands. On his return he carried out, in the years 1874-75, an extensive series of experiments on torpedoes, the work being undertaken on behalf of Sir William Armstrong & Co. In 1875 his reputation as a careful and ingenious experimentalist led to his employment by Lord Raleigh in some experiments in connection with his work on the "Theory of Sound." In 1877 he returned to Froude, and assisted in the development of the marine engine dynamometer. Froude's health breaking down, he asked Mr. Beauchamp Tower to accompany him in his voyage to the Cape, where he died. On Mr. Tower's return to England in 1878 he commenced practice on his own account. It was then that he developed his most famous spherical engine. As will be remembered, the great engineering problem in the early 'eighties was to build a steam engine suitable for direct coupling to the dynamos as then built. The latter required a high speed of rotation. American and Continental engineers solved the difficulty by using belt-drive, but English engineers were even then convinced that a direct coupling of engine and dynamo, now universally adopted, was the correct method of procedure. As the speed of rotation of the dynamos then built was far in excess of that of any ordinary engine, many ingenious types of rotary engine were devised which could be run at the required speed, and of

these the spherical engine was, perhaps, the best. Mr. Tower's engine was taken up by a syndicate, of which Sir Frederick Bramwell was a member. The latter, before concluding the agreement, insisted that the engine should run satisfactorily three million revolutions. This was successfully accomplished, and a fair number of the engines were built and put into use, amongst others, by the admiralty, for ship lighting. In its day, a Tower spherical engine driving a dynamo was the lightest unit that could be supplied, and as long as steam pressures were relatively low, it worked remarkably well. In 1884 Mr. Beauchamp Tower was elected a member of the Institution of Civil Engineers, without being required to pass first through the grade of associate member. He was nominated by Sir W. G. Armstrong, and among the signatories of his nomination paper were included Sir William Thompson, Thomas Hawksley, J. Wolfe-Barry and J. I. Thornycroft.

Mr. Tower is, perhaps, best known to engineers in general by his experiments on journal friction, carried out for the Institution of Mechanical Engineers. The first of his reports was published in November, 1883, and marked an epoch in our knowledge of the subject. Up till that date it had been considered that General Morin's experiments had established certain laws of friction which were of universal applicability. Practical engineers had, however, found it difficult to bring into accordance with these so-called laws their experience with actual journals and it was this fact which led the Institution of Mechanical Engineers to undertake the investigation, which they entrusted to Mr. Tower. These experiments showed conclusively that though Morin's laws might represent fairly the condition of a journal on the point of "seizing," they applied in no degree to the friction of a well-lubricated bearing. Thus, in place of the friction being proportional to the pressure, it was found to be, within wide limits, almost independent of it. He discovered that in the case of a well-lubricated journal the metal surfaces never touch, being separated by a continuous film of oil. The fact thus established has led to a revolution in the practice of lubrication. For example, high-speed journals are now provided with a supply of oil out of all proportion to what would have been considered sufficient in the early 'seventies, and as a consequence the tool marks are now often still visible on a journal which has made some millions of revolutions.

The adoption of forced lubrication, and the great extension which the system of ring lubrication has taken within recent years, may justly be considered as the outcome of Mr. Tower's researches. Mr. Tower had some difficulty in interpreting his results, as he held that the friction in a well-lubricated journal being found to be wholly fluid friction, the coefficient should vary as the square of the linear velocity of the rubbing surfaces; but, as a matter of fact, it was found to increase much less rapidly. The explanation was provided by Professor Osborne Reynolds, whose experiments showed that up to a certain critical velocity, fluid friction varied directly as the velocity, and not as the square.

Perhaps the great disappointment of Mr. Tower's life was the failure of the admiralty to adopt his "steady platform" for guns and searchlights at sea. By a most ingenious gyroscopic device Mr. Tower succeeded in maintaining within half a degree the horizontality of a gun platform mounted on ship-board, in spite of the oscillations of the vessel. The device was tested by the admiralty, who certainly encouraged the inventor to devote his time to these experiments; but who, finally, in spite of the success of the trials, decided that the apparatus was unsuitable for the service. The principal reason given for this decision was that the weight needed for the "steady platform" could be more usefully employed in carrying an extra gun or extra ammunition. Though naturally disappointed by this unexpected rebuff, Mr. Tower proceeded to adapt his steady platform for use on cross-channel steamers. He was engaged in this work at the time of his death.

NATIONAL BOARD OF TRADE

Most important was the annual meeting of the National Board of Trade held in Washington last week. In its three days' session it comprised more actual business than has marked its proceedings for a number of years past. After a brief business session on the first day the annual banquet was held in the New Willard Hotel in the evening at which the speakers were Speaker J. G. Cannon of the house of representatives, Hon. T. E. Burton, chairman of the committee of rivers and harbors; Mr. Joseph R. Garfield, commissioner of corporations, and Mr. J. Hampton Moore, commissioner of manufactures. Col. J. J. Sullivan of Cleveland acted as toastmaster.

Speaker Cannon in his brief talk paid an impressive eulogy to Senator Hanna and then discussed the appropriations of the short session. He was quite insistent in stating that the army and navy should be maintained no matter what else might have to be reduced. As an instance of the great growth of appropriations he cited the single circumstance that since McKinley's first inauguration the postoffice appropriation has grown from \$80,000,000 to \$180,000,000.

Mr. Burton in his talk discussed the necessity for a higher standard of public virtue and then spoke of discrimination in freight rates and international arbitration.

Mr. James R. Garfield stated that the department of commerce and labor had no disposition to impose unreasonable restrictions upon commerce but merely desired to develop it along right lines.

Mr. J. Hampton Moore has only recently been appointed to the head of the division of manufactures and was consequently therefore unable to discuss the work of the bureau. He said, however, that he hoped the bureau would be of advantage to the National Board of Trade eventually.

President Sullivan's address at the opening session of the National Board of Trade was very brief. Referring to the problems before the country he said:

That our country is now entering upon a period of great industrial and commercial activity, as well as political advancement, will, I am sure, be admitted by every one who is informed on the trend of events, and that fact should brighten the glow in the heart of every patriot. Indeed, it seems that to us has been bequeathed the period when commercial and industrial forces are to put forth their mightiest energies. Today our manufacturers and our merchants are extending their business relations to every portion of the globe, and our country is rapidly becoming the commercial and financial center of the world.

Great public questions are continually forcing themselves upon us for consideration and solution. What shall be our theory of taxation? Shall we favor reciprocity with our neighbors? Shall we favor and encourage international banking, and thereby aid our business men by commercial relations with the nations of the world? What shall be our attitude toward the building up of our merchant marine? These and many similar questions are now before the American people, and must be settled by an enlightened public sentiment. I know of no organization that is better qualified to deal with such problems than is the National Board of Trade.

Among the committees appointed the one on the American merchant marine was as follows: Harvey D. Goulder, Cleveland, chairman; Wallace M. Bell, Milwaukee; F. W. Curtis, New York; W. W. Foulkrod, Philadelphia; James W. Porch, New Orleans; G. Waldo Smith, New York; Clinton White, Boston, and Edward R. Wood, Philadelphia.

The National Board of Trade is made up of representatives of boards of trade and chambers of commerce throughout the country and it was significant indeed that nearly all the resolutions presented by the subsidiary organizations were upon the necessity of the upbuilding of the merchant marine of the United States in the foreign trade. The Boston Chamber of Commerce declared that "It is the duty of congress to render all possible assistance and encouragement for the improve-

ment and maintenance of American shipping." The New Orleans Board of Trade offered a resolution quite of the ordinary asking the national organization to favor "the establishment of a steamship company with a capital of \$5,000,000 to ply its steamers between New Orleans and Panama; and further that the organization secure through a committee the co-operation of the commercial bodies of the principal cities of the Mississippi valley and the south." The Philadelphia Board of Trade commended the work of the Congressional Merchant Marine Commission looking after the resuscitation of American commerce and the establishment of a regular mail service to the ports of Europe and South America.

On the second day the delegates of the National Board of Trade to the number of 100 marched in a body to the White House where they were received by President Roosevelt, Col. J. J. Sullivan making the introductions.

At the second day's session Mr. Harvey D. Goulder of Cleveland, president of the Merchant Marine League of the United States, made a powerful plea for the relief of American shipping in the foreign trade. He pointed out the urgent need for rehabilitating the merchant marine of this country and favorably discussed the work of the Congressional Merchant Marine Commission which was appointed at the previous session to inquire into the state of American shipping in the foreign trade. He said that it was the one great industry of the country that had not been protected. He believed that ships should be built on the Atlantic, Pacific and Gulf coasts as plentifully as they are built on the great lakes.

Mr. Edward R. Wood of Philadelphia, of the committee on merchant marine, then presented the report of his committee on that subject as follows:

Resolved, That the National Board of Trade heartily commends the work of the Congressional Merchant Marine Commission and urges upon congress the enactment at the earliest possible date of Senate bill No. 6291.

In addition to this the proposition of the New Orleans Board of Trade to bring about a steamship line from New Orleans to Panama was recommended. These resolutions were unanimously adopted.

At the last day's session of the convention the board unanimously placed its approval upon the subject of international arbitration tariff reciprocity, the improvement of inland waterways and the development of forestry and irrigation.

The following officers were unanimously re-elected: Col. J. J. Sullivan, Cleveland Chamber of Commerce, president; George H. D. Johnson, Milwaukee, first vice president; Charles S. Hamlin, Boston Chamber of Commerce, second vice president, and W. R. Tucker, Philadelphia Board of Trade, secretary-treasurer.

The board of managers for the coming year, appointed by the president, is as follows: James W. Porch, New Orleans Board of Trade; Finley Acker, Philadelphia Trades League; James F. Parker, New York Produce Exchange; E. J. Lloyd, Pittsburg Merchants and Manufacturers' association; James T. McHugh, Cincinnati Chamber of Commerce, and Josiah Marvel, Wilmington Board of Trade.

The members of the council so far announced who will serve during the year are Albert McCullough, American Trade Seed association; W. T. Robinson, American Warehousemen's association; E. G. Preston, American Chamber of Commerce; Emory A. Lawrence, Boston Merchants' association; Charles B. Murray, Cincinnati Chamber of Commerce; Harvey D. Goulder, Cleveland Chamber of Commerce; John W. Craddock, National Shoe Wholesalers' association; Charles H. Jones, New England Shoe & Leather association; James F. Parker, New York Produce Exchange; Henry T. Atkins, Ohio State Board of Commerce; E. L. Rogers, Philadelphia Commercial Exchange; William S. Harvey, Philadelphia Commercial Museums; George H. Anderson, Pittsburg Chamber

of Commerce; E. L. Lloyd, Pittsburg Merchants & Manufacturers' association; F. L. Hitchcock, Scranton Board of Trade; A. P. Fardon, Washington Board of Trade, and William D. Mullen, Wilmington Board of Trade.

Much discussion was caused by the report of the committee on improvements of waterways submitted by Mr. James W. Porch of New Orleans. The report was lengthy and as adopted, favored measures for the ultimate construction of a system of coastwise canals on the Atlantic coast; congressional appropriations looking to the improvements of the Mississippi valley from floods; the improvement of the Ohio river from its head waters to Cairo and liberal appropriations for all inland waterway development.

Chairman Burton of the rivers and harbors committee sent a letter to the board in which he expressed his opinion that the board should not make any specific recommendation. He stated that the board met but once a year and therefore could not in that time pass wisely upon the measures involved in the rivers and harbors bill. The resolutions of the committee were, however, adopted.

Mr. Harvey D. Goulder of Cleveland presented a resolution declaring for regular appropriations for waterways on the part of congress and that when placed the projects for which they were intended should be carried out with promptness. This was unanimously adopted.

It was commonly reported that the meeting was one of the most spirited in the history of the board and it looks indeed as though the National Board of Trade has obtained renewed energy. Under its present management it is calculated to become a power in the country.

DEATH OF CAPT. HENRY J. JOHNSON

Capt. Henry J. Johnson, who was prominent among vessel owners on the lakes up to a few years ago and who was in command in the days of small schooners, died at his home in Green Springs, O., Tuesday night, aged 71 years. He was born on Water street, Cleveland, near the old lighthouse site where the W. J. Gordon homestead was afterwards located. As a young man he sailed for the Winslows, commanding the schooner Wm. Case, schooner Wm. D. Ogden and other well known vessels of those days. He afterwards owned the schooners A. C. Maxwell, Helvetia, Minnehaha, steamer Kelley and consort Warner and steamer V. Swain. Among large wooden steamers which he built were the Horace Tuttle, Henry J. Johnson and George Presley. About ten years ago Capt. Johnson bought the Oakridge Sanitarium at Green Springs. He was attracted to the place because of benefits in health which he himself derived there.

COMPETITION IN THE COAL TRADE

The coming season will witness more competition in the coal trade on the great lakes than has marked it since the Pittsburg Coal Co. was formed five years ago. When the Pittsburg Coal Co. was organized the coal interests of M. A. Hanna & Co. and Pickands, Mather & Co. were sold to it. At the same time an agreement was made whereby the two Cleveland firms were to handle the product of the mines of the Pittsburg Coal Co. for five years. This contract expired on Jan. 1 last. Both firms are therefore independent of the Pittsburg Coal Co. and will engage in the lake coal trade in competition with it. When Mr. Martin Mullen entered the firm of M. A. Hanna & Co. it was predicted that it meant competition in this trade. Mr. Francis L. Robbins, president of the Pittsburg Coal Co., admits that the contracts with the two firms mentioned are not to be renewed and expects competition as a result, but he does not look forward to any shaking of rates.

WHY SHIPS ARE ALL LENGTHENED 72 FT.

Editor Marine Review: Will you kindly publish in your paper if there is any particular reason why the boats to be lengthened this winter are all to be lengthened 72 ft. Thanking you in advance for the favor, I remain,

L. W. HILBERT.

139 E. 8th street, Erie, Pa.

The Review had asked the question of Mr. Robert Logan, general manager of the American Ship Building Co. earlier in the week and Mr. Logan explained that the additional length was based upon the hatch multiple. Hatches on the older boats are spaced 24 ft. centers, that is it is 24 ft. from the center of one hatch to the center of the other. Seventy-two ft. therefore, provides for three more hatches, affording considerable more carrying power and not making length to beam disproportionate.

AROUND THE GREAT LAKES

The case against Capt. George W. McCullaugh, master of the steamer Sultana, charged with violating the rules of the St. Clair ship canal last July, has been dismissed.

Capt. F. A. Fick of Cleveland will bring out the new steamer James E. Davidson which is building at the Great Lakes Engineering Works, Detroit, for Mr. G. A. Tomlinson of Duluth.

The next steamer to be launched by the American Ship Building Co. will be the James C. Wallace building at Lorain for the Acme Steamship Co. This will occur some time in February.

Capt. C. B. Dalton who sailed the steamer Moses Taylor last season will bring out the steamer Stephen M. Clement now building at Lorain for the Buffalo & Susquehanna Steamship Co.

Secretary T. J. Dolan, Jr., of the Brotherhood of Steamshovel & Dredgemen of America has established a new local at Amherstburg. Wm. Rains was elected president and J. J. Ryan secretary and treasurer.

The suit growing out of the collision between the steamers Sacramento and Gladstone near Bar Point, Lake Erie, in November, 1903, will be called in the United States court before Judge W. H. Seaman on Feb. 1.

During the summer of 1904, 275,223 pieces of mail were delivered to boats from the Marine post office at Detroit and \$9,586 were received. This amount is smaller than usual, owing to the brevity of the season last year.

Capt. Wm. Fitzgerald who has been an inspector of hulls for the United States steamship inspection service at Milwaukee for the past thirty-four years has resigned. Capt. Fitzgerald was appointed to the place by President Grant, having previously been a master of vessels.

Among the vessels holding coal cargoes at Milwaukee are the steamers Frank Gilchrist, Mary Elphicke, Watson, Mars, Christopher, Major, F. B. Squire, Lagonda, Frank W. Hart, Rappahannock, A. E. Stewart, Charles Warner, R. L. Ireland, Wm. E. Reis, Yuma, Hendricks, S. Holden, Selwyn Eddy and the barge Armenia.

The Tug Firemen & Linemen's Protective association at its annual meeting in Buffalo elected the following officers: Grand president, John Bourke, Sault Ste. Marie, Mich.; grand vice president, Max Elzet, Milwaukee; grand secretary and treasurer, M. Gluckle, Duluth; assistant grand secretary and treasurer, Daniel Cotter, Buffalo.

Capt. Thomas Barry of the steamer F. & P. M. No. 1 and Capt. Frank Richardson of the steamer Illinois, whose licenses were revoked at the time of Rear Admiral Fields' inspection of shipping at Chicago, have been given their papers back. Both men had to take the regular examination for masters before Inspectors Mansfield and Peck before their licenses were renewed.

TRADE NOTES

The Reliable Foundry Co., Quincy, Ill., is in the market for a 15-H. P. gasoline engine, a first-class one, but preferably second-hand.

David Kahnweiler's Sons announce that they have removed their office to Fox building, corner Franklin square and Dover street, New York.

The American Steel & Wire Co. has issued a little bulletin devoted to telephone and telegraph wires. The bulletin is well illustrated with the various makes of wires for these purposes and will be sent to anyone interested.

The Atlantic Works, Inc., Philadelphia, Pa., recently received an order from James Shewan & Sons of New York city for one of their adjustable bevel band saw machines and a 30-in. endless bed double surfer to be used in their ship yard work.

Alfred B. Sands & Sons Co., 242 Water street, New York, have just issued a catalogue to the trade stating that they had a slight fire in their factory, but that it will in no way interfere with filling orders except possibly a slight delay of a few days.

The office and manufacturing plant of the Globe Iron Works formerly of Minneapolis are now located at Menominee, Dunn county, Wis. The new plant is modern in its equipments throughout and is better fitted than ever to build the reliable White gasoline engines.

Prominent among the numerous marine exhibitions at the Louisiana Purchase exposition was that of Jeffery's patent marine ship's glue which was granted the highest award given for marine glue. The product is handled by L. W. Ferdinand & Co., 152 Federal street, Boston, Mass.

The Susquehanna Coal Co. has issued a little memorandum book of pocket size which contains a great deal of useful information as well as a map in small of the United States. It is intended as a personal work of reference to be used throughout the year.

The Oshkosh Boat & Canoe Co., builders of boats, canoes, launches at No. 2 Main street, Oshkosh, Wis., has just issued a circular containing illustrations of their various types of craft. Anyone in need of a small boat would do well to write for the circular.

The Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa. has just sent out a circular devoted to oil switches and oil circuit breakers. Like everything else issued from the publishing department of this company it is both thorough and beautiful. Anyone interested in the subject should write for it.

The Yale & Towne Mfg. Co., 9-13 Murray street, New York, have issued a little booklet entitled "Three Labor Savers," meaning the Yale Towne triple blocks, duplex blocks and differential blocks. The little booklet illustrates the difference in hoists and is worth writing for by those who may be in need of blocks.

The Pacific oil tank steamer Atlas, carrying 15,000 barrels of oil in bulk, is now engaged in towing one of the company's barges, carrying 20,000 barrels, from New York to San Francisco. Both these vessels are provided with a Shaw & Spiegle steam towing machine manufactured by the American Ship Windlass Co. The outcome of this trip will be watched with interest as the distance to be traversed is 14,000 miles. There are nearly 200 of these machines in operation on vessels in the United States, eleven of them being on vessels belonging to the Standard Oil Co.

The Smooth-On Manufacturing Co., manufacturers of Smooth-On packing, 572-574 Communipaw avenue, Jersey City, N. J., have just sent out a pocketbook containing a magnet and a piece of Smooth-On sheet packing. The packing is easily attracted by the magnet, showing the high percentage of Smooth-On contained in the packing. One of these pocket-

books containing a magnet and sheet of Smooth-On packing will be sent to any engineer upon receipt of five cents to pay for postage. The Smooth-On cement packing, manufactured by this company, is a combination of Smooth-On, iron cement and rubber and has extraordinary resistance to high temperatures and high pressures.

The Penberthy Injector Co. of Detroit have recently published a new catalogue which describes and illustrates their entire line for the year 1905. The catalogue is a handsome book which will be greatly appreciated by every dealer into whose hands it is placed. Besides the well known Penberthy automatic injector, familiar to so many steam users, it lists and describes a very full line of steam specialties, including the Penberthy auto-positive injectors, ejectors, force-feed oil pumps, oil and grease pumps, high and low water alarms, water gauges, cage cock and other engine room necessities. The catalogue is conveniently indexed and every dealer who handles steam specialties should have a copy of it, as it will be of great value to him for daily reference. It is well printed and handsomely illustrated in a way which does credit to the Penberthy Injector Co.

The Pearson Manufacturing Co., Allegheny, Pa., has just issued a bulletin devoted to the Pittsburgh boiler built for land or marine use in units of from 100 to 500 H. P. Concerning the boiler the circular says: "From two water drums are connected three legs, the center leg or mud leg being the lowest part of the boiler, thus acting as a mud drum. The circulation being from center to front and from center to rear water legs, depositing all scale or sediment in mud leg, which is of easy access by having a man-hole placed at each end to permit of thorough cleaning and inspection. Cast iron caps are placed opposite each tube in front and rear legs, thus permitting an inspection of entire boiler. From the front leg are securely rolled 4-in. tubes which connect the mud leg on a slight decline, and from mud leg to rear water leg 3-in. tubes are inserted, giving ample combustion and a free passage of smoke.

An emery wheel dresser manufactured by the International Specialty Co., 35 Holden avenue, Detroit, Mich., is designed to take the place of the expensive black diamond. This is a most efficient tool for the purpose, and the makers write us that it will do the work of truing and shaping emery wheels in as satisfactory a manner as the diamond dresser. The Semi-Diamond dresser is a steel tube filled with the hardest abrasive that can be obtained, which presents new cutting edges the entire length of the tube and as long as it lasts, which is from three to five years with ordinary use. The dresser is not recommended for water grinders or very hard wheels, although it can be used on such if necessary. Its efficiency is best demonstrated on grades up to medium hard.

The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has issued an exceedingly useful little publication. Every one has use for a memorandum book and it is conveniently made pocket size with sufficient number of blank leaves for memorandum purposes. In addition it contains memorandum spaces dated for each day in the year so that one may conveniently keep a schedule of his appointments. It also has a cash account space arranged by months. So much for the personal diary. On the first page is given the calendar for the year, then comes a page to be devoted to the name and address of the owner and forty pages follow of engineering data for electrical and mechanical engineers, including the statistics of the 1900 census as concerns the population of cities, and domestic and foreign rates of postage. In the back of the book is given the system of weights and measures, valuable information concerning first aid to the injured and directions for cleaning stains, dirt and rust from various substances. It is not only a personal diary, but an encyclopedia in little.



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CLEVELAND, O., JANUARY 26, 1905.

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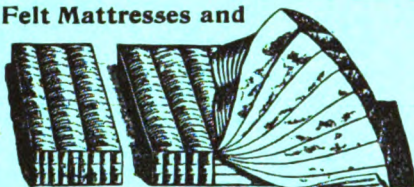
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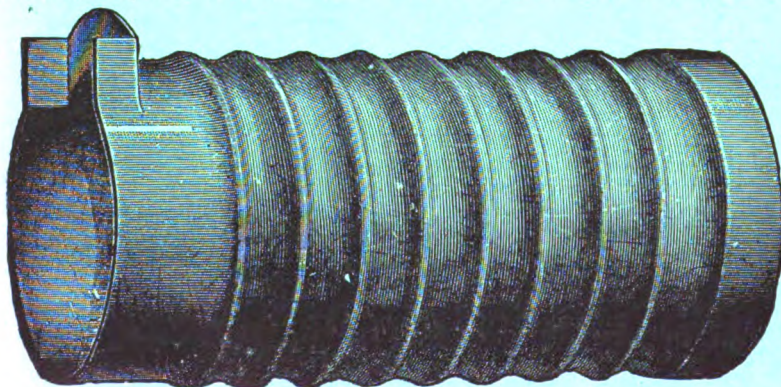
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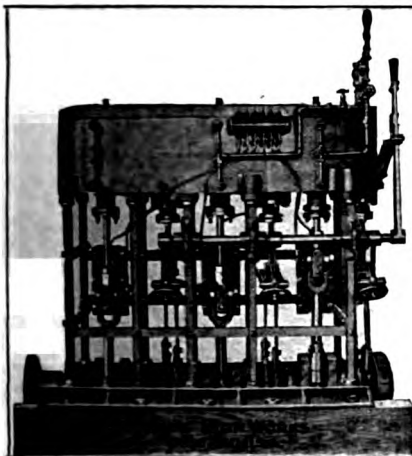
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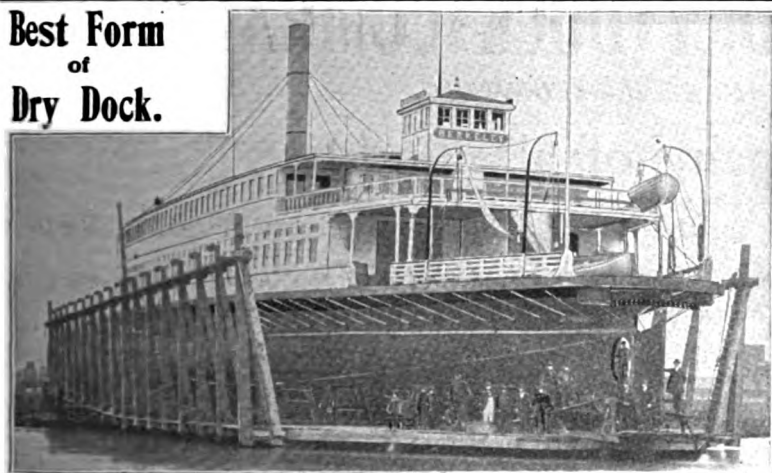
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**Best Form
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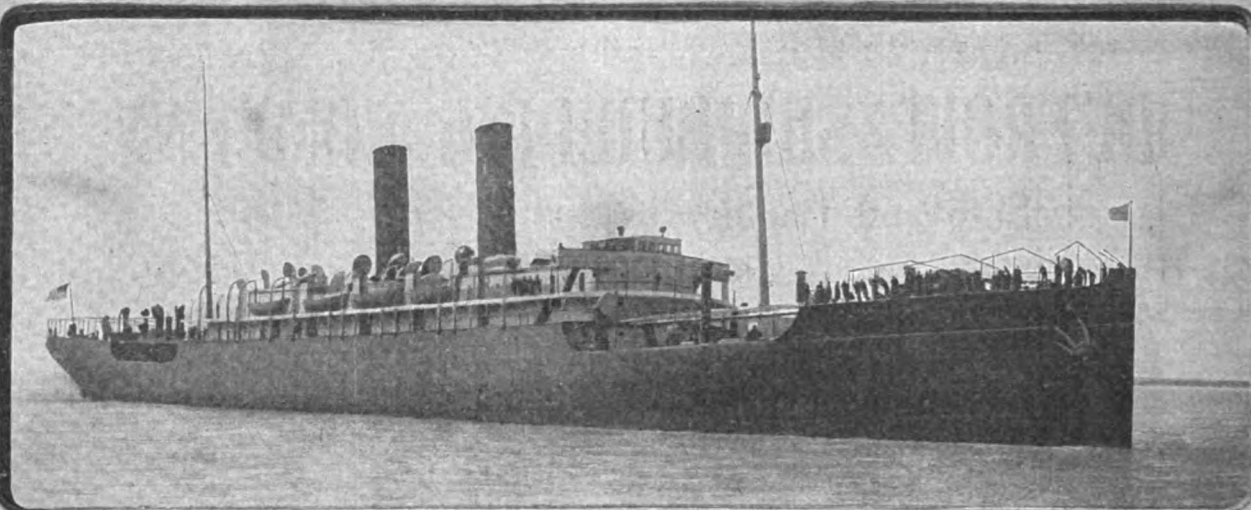
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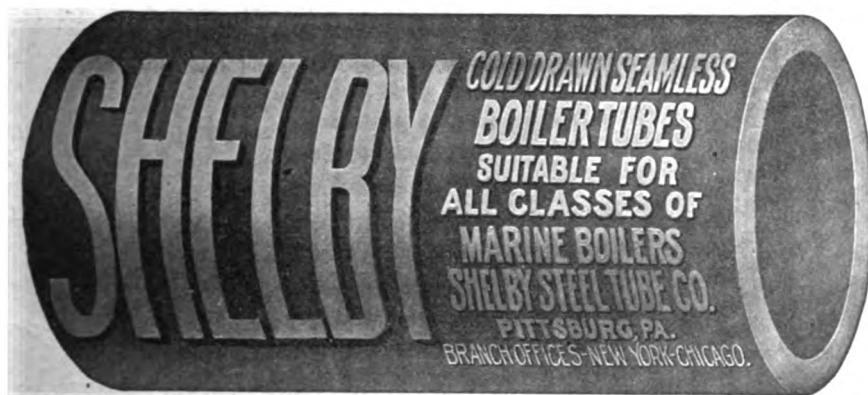
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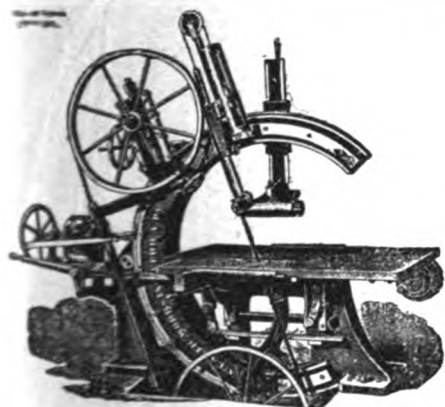
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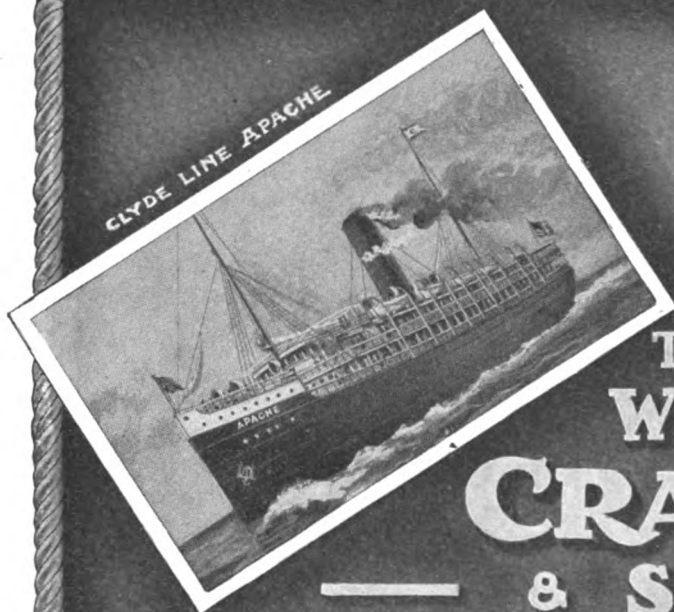
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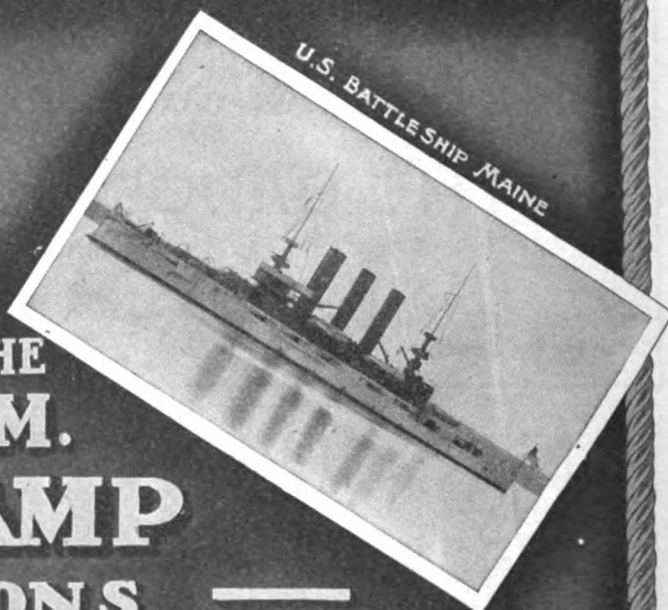


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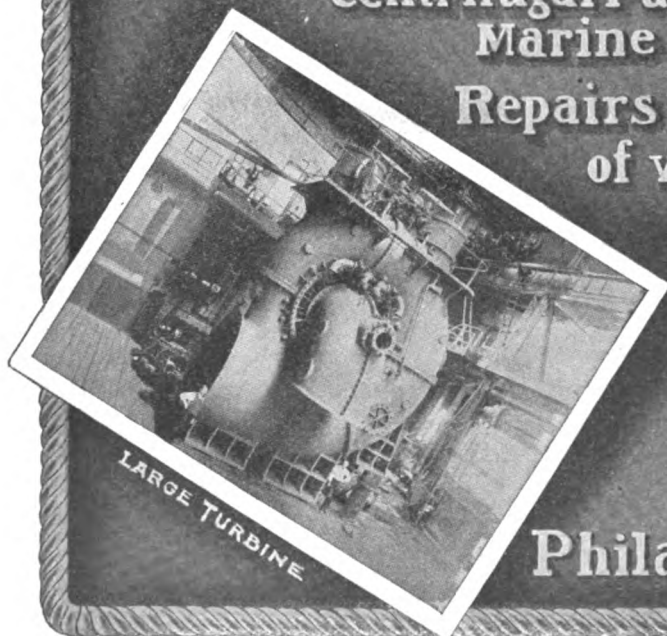
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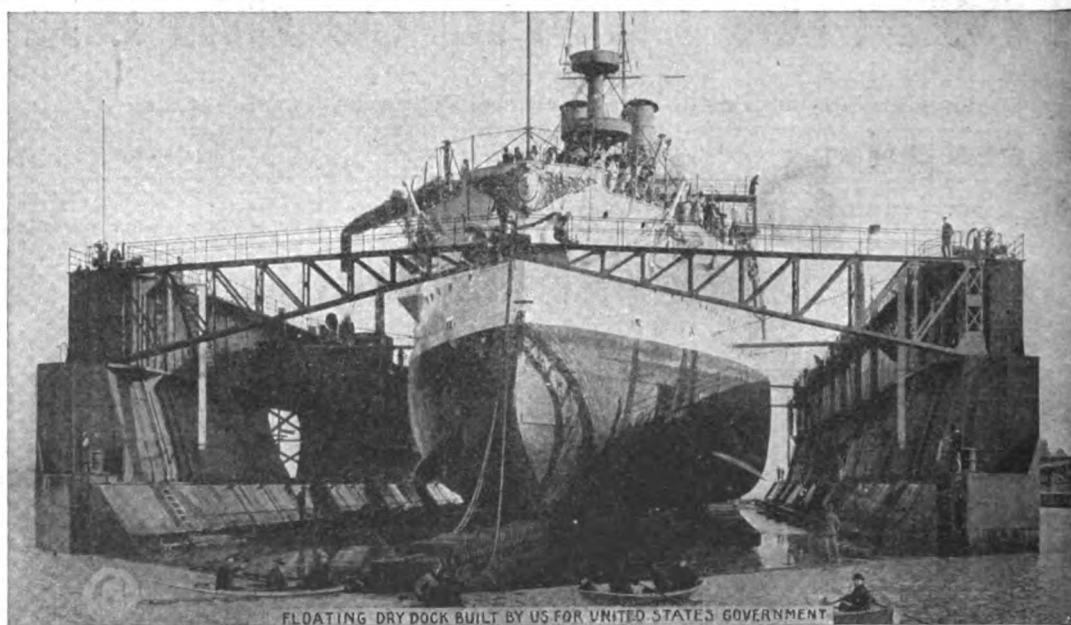
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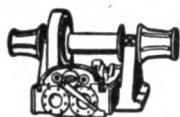
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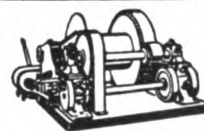
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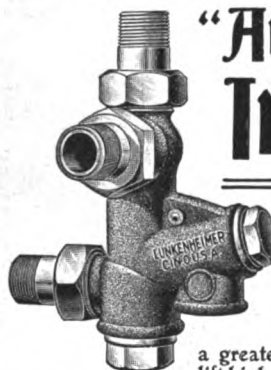
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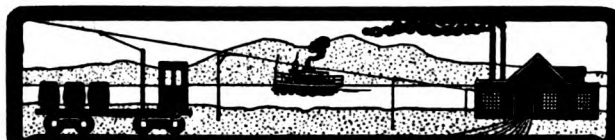
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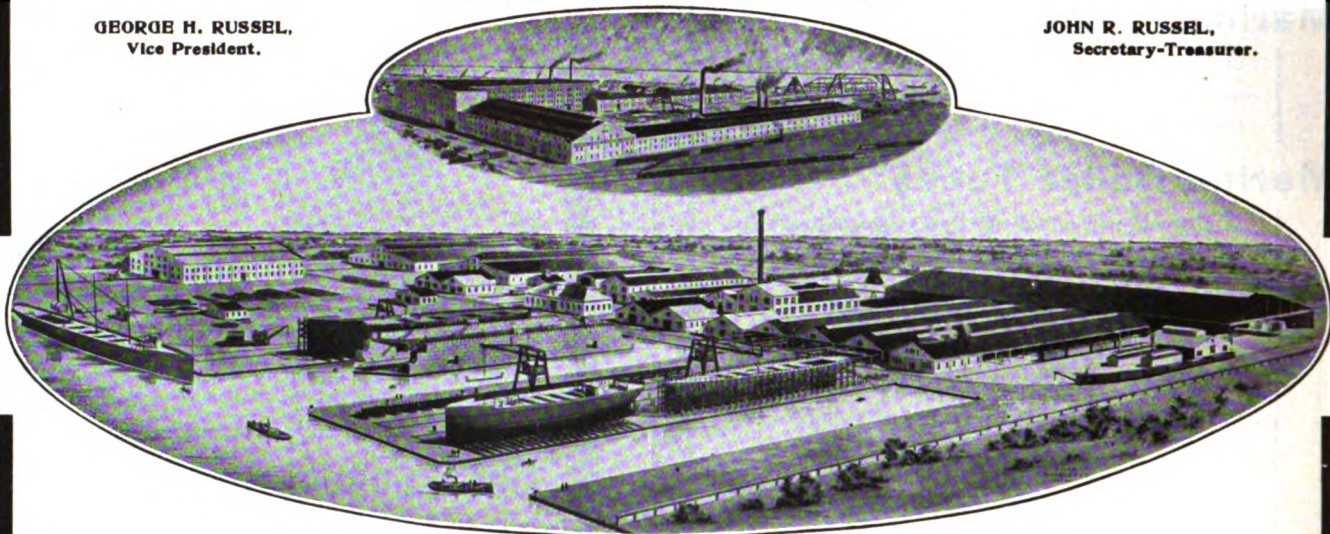
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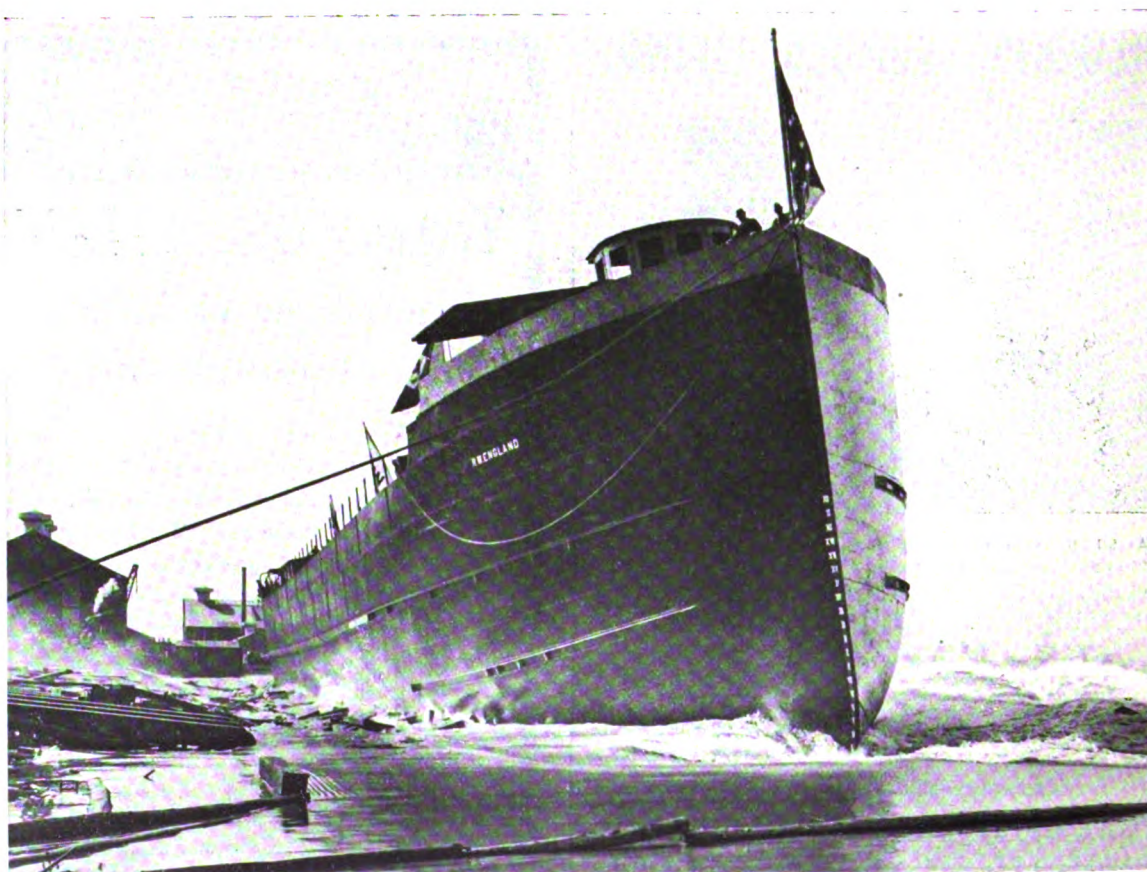
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Russian Imperial Navy	-	-	-	-	-	-	-	224,500	"
Japanese Imperial Navy	-	-	-	-	-	-	-	122,700	"
Austrian Imperial Navy	-	-	-	-	-	-	-	56,700	"
Italian Royal Navy	-	-	-	-	-	-	-	13,500	"
Chilian Navy	-	-	-	-	-	-	-	26,500	"
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Total Horse Power of Boilers <u>in Use</u>	-	-	-	-	-	-	-	1,884,860	

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NEW METAL CARGO HOISTERS

Wrought Iron Hook and Strap, Galvanized Iron Shells and Sheaves. Sheaves fitted with Genuine Star Metaline Bushings with Metaline Side Bearings.

These Blocks Save the Rope and Outwear all others.

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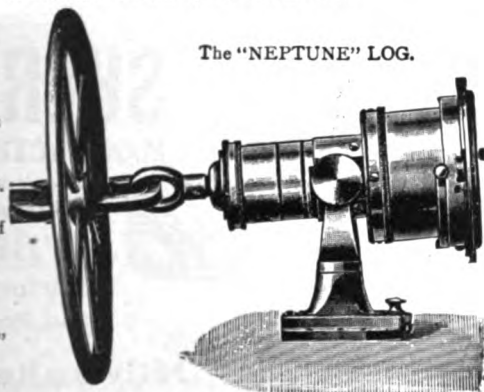
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Submarine Drill Boat for Sale.

New submarine drill boat for sale. Hull 72 ft. by 24 ft., 5 ft. sides. Enquire of Hickler Bros., Sault Ste. Marie, Mich. tf

PROPOSALS FOR DREDGE.—Mississippi River Commission, Fullerton Building, St. Louis, Mo., Jan. 16, 1905.—Sealed proposals, in triplicate, for construction and delivery of self-propelling hydraulic dredge and ponton pipe line will be received here until 12 noon, standard time, March 17, 1905, and then publicly opened. Information furnished on application. WM. B. LADUE, Capt., Eng'rs, Sec'y. Mar. 9

U. S. ENGINEER OFFICE, Jones Building, Detroit, Mich., January 16, 1905. Sealed proposals for dredging in lower Detroit River, will be received here until 2 p. m., standard time, February 16, 1905, and then publicly opened. Information furnished on application. CHAS. E. L. B. DAVIS, Lieut. Col., Eng'rs. Feb. 9

U. S. ENGINEER OFFICE, 1637 Indiana ave., Chicago, Ill., Jan. 4, 1905. Sealed proposals for dredging and constructing docks in Chicago river, Ill., will be received here until 12 noon, Feb. 4, 1905, and then publicly opened. Information on application. O. H. ERNST, Col., Engrs. Feb. 2

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One fore and aft compound marine engine. Cylinders 27 x 50 x 40. Enquire of the Montague Iron Works, Montague, Mich. Jan. 26

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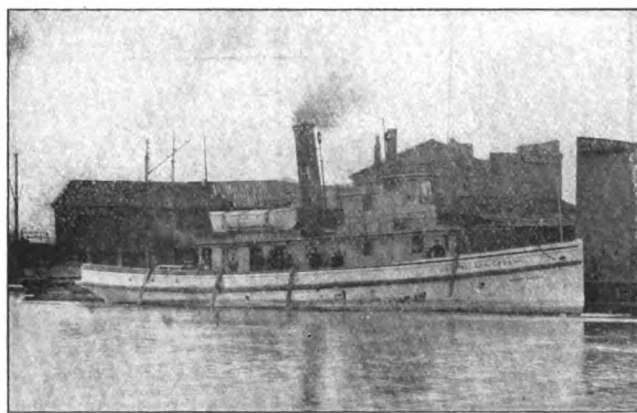
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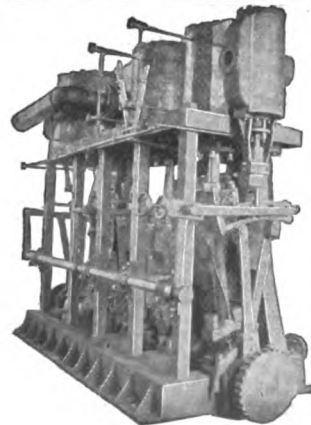
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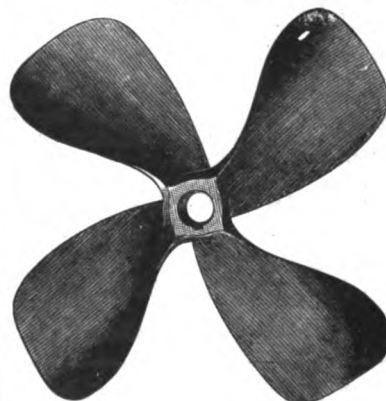
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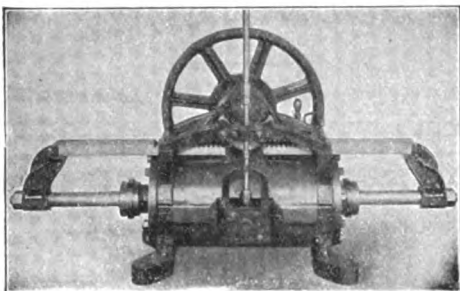
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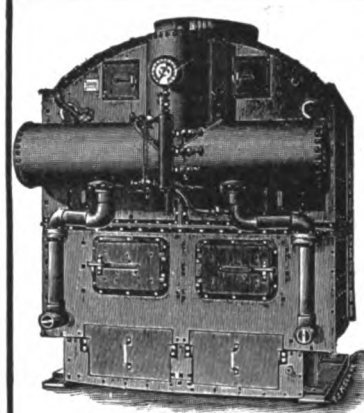
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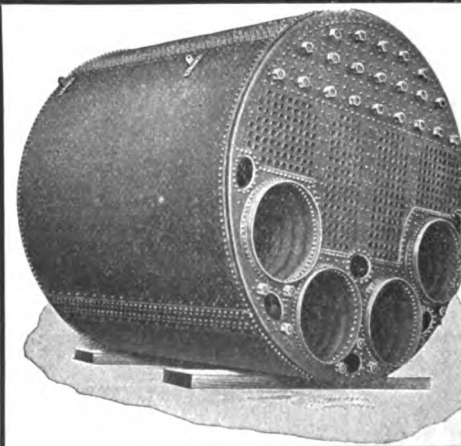
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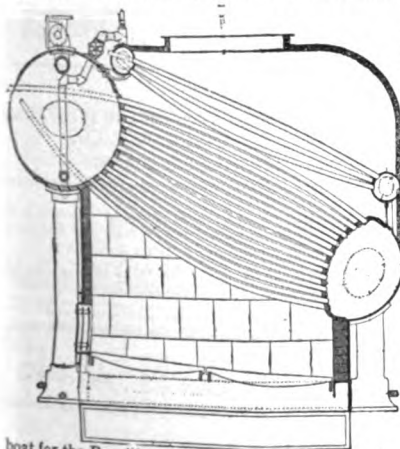
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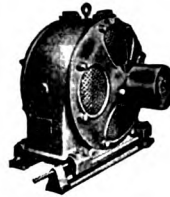
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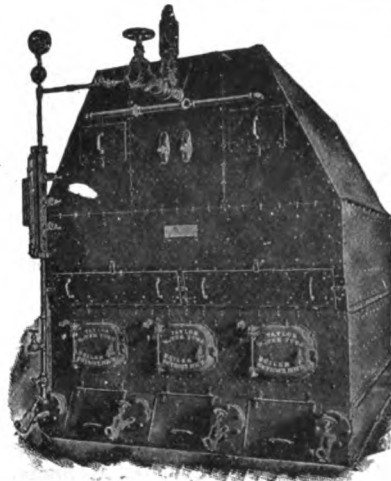
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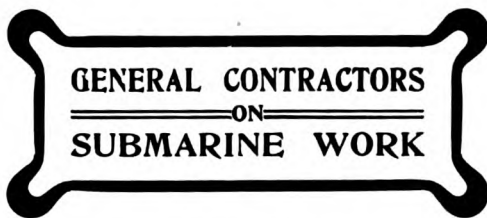
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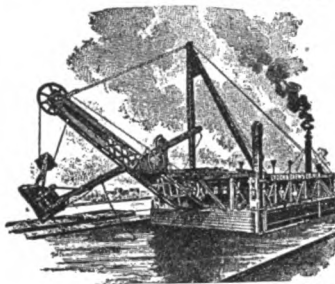
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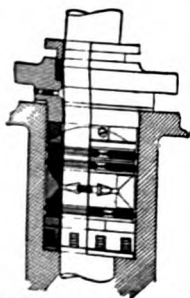
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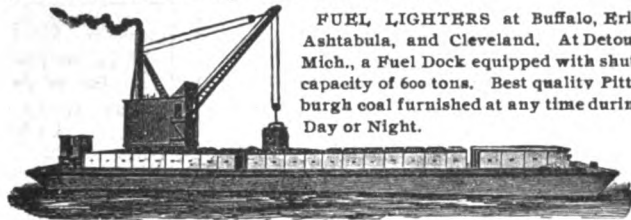
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IRON ORE AND PIG IRON.

Bourne-Fuller Co. Cleveland, O.
Hanna, M. A. & Co. Cleveland.
Pickands, Mather & Co. Cleveland.
Reading Iron Co. Reading, Pa.

LAMPS, INCANDESCENT.

Westinghouse Elec. & Mfg. Co. Pittsburg, Pa.
Sawyer-Man Electric Co. Pittsburg, Pa.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Georgian Bay Engineering Works.
..... Midland, Ont.
Marine Iron Works. Chicago.
Truscott Boat Mfg. Co. St. Joseph, Mich.
Willard, Chas. P. Winthrop Harbor, Ill.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong, Cork Co. Pittsburg.
Drein, Thos. & Son. Wilmington, Del.
Kahnweiler's Sons, D. New York.

LIGHTS, SIDE AND SIGNAL.

Russell & Watson Buffalo.

LOGS.

Walker & Sons, Thomas Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph. Jersey City, N. J.

LUBRICATORS.

Crane Co. Chicago.
Lunkenheimer Co. Cincinnati.

LUMBER.

Martin-Barriss Co. Cleveland.

MACHINISTS.

Chase Machine Co. Cleveland.
Hickler Bros. Sault Ste. Marie, Mich.
Lockwood Mfg. Co. East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc. Philadelphia.

MARINE RAILWAYS.

Hickler Bros. Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.

Crandall & Son, H. I. East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W. New York.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co. Cleveland.
Detroit Ship Building Co. Detroit.
Great Lakes Engineering Works Detroit.
Sturtevant, B. F. Co. Hyde Park, Mass.

METALLIC PACKING.

Katzenstein, L. & Co. New York.

METAL POLISH.

Bertram's Oil Polish Co. Boston.

MOTORS, GENERATORS—ELECTRIC.

Fisher Electrical Works. Detroit.
General Electric Co. Schenectady, N. Y.
Sturtevant, B. F. Co. Hyde Park, Mass.
Westinghouse Electric & Mfg. Co.
..... Pittsburg, Pa.

Buyers' Directory of the Marine Trade.—Continued.

NAUTICAL INSTRUMENTS.

Ritchie, E. S., & Sons.....Brookline, Mass.

NAUTICAL SCHOOLS.

Chicago Nautical School.....Chicago.

NAVAL ARCHITECTS.

Hynd, Alexander.....Cleveland.
 Kidd, Joseph.....Duluth, Minn.
 Kreer & Parsons.....Chicago.
 Lovejoy, H. O.....Buffalo.
 Matteson & Drake.....Philadelphia.
 Mosher, Chas. D.....New York.
 Nacey, James.....Cleveland.
 Rice, Henry.....Buffalo.
 Wood, W. J.....Chicago.

OAKUM.

DeGrauw, Aymer & Co.....New York.
 Stratford, Oakum Co.....Jersey City, N. J.

OIL ENGINES.

Mietz, Aug.....New York.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
 Standard Oil Co.....Cleveland.

PACKING.

Crane Co.....Chicago.
 Jenkins Bros.....New York.
 Katzenstein, L. & Co.....New York.
 New York Belting & Packing Co.....New York.

PACKING TOOL.

Matteson & Drake.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
 Detroit Varnish Co.....Detroit.
 Detroit White Lead Works.....Detroit.
 New Jersey Zinc Co.....New York.
 Upson-Walton Co.....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co.....Buffalo.
 Chicago & Gt. Lakes Dredge & Dock Co.....Chicago.
 Dunbar & Sullivan Dredging Co.....Chicago.
 Fitz-Simons & Connell Co.....Chicago.
 Hickler Bros.....Sault Ste. Marie, Mich.
 Lake Superior Contracting & Dredging Co.....Duluth, Minn.
 Parker Bros. Co., Ltd.....Detroit.
 Smith Co., L. P. & J. A.....Cleveland.
 Starke Dredge & Dock Co., C. H.....Milwaukee.
 Sullivan, M.....Detroit.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland, O.
 Crane Co.....Chicago.
 Macbeth Iron Co.....Cleveland.
 Reading Iron Co.....Reading, Pa.

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.....Cleveland, O.
 Otis Steel Co.....Cleveland.
 Reading Iron Co.....Reading, Pa.

PRESSURE REGULATORS.

Kieley & Mueller.....New York.
 Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Cramp, Wm. & Sons.....Philadelphia.
 Detroit Ship Building Co.....Detroit.
 Fore River Shipbuilding Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Marine Iron Works.....Chicago.
 Milwaukee Dry Dock Co.....Milwaukee.
 Newport News Ship Building Co.....Newport News, Va.
 Roelker, H. B.....Chicago.
 Sheriffs Mfg. Co.....Milwaukee.
 Superior Ship Building Co.....Superior, Wis.
 Thropp & Sons Co., J. E.....Trenton, N. J.
 Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.

General Electric Co.....Schenectady, N. Y.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.
 Great Lakes Engineering Works.....Detroit.
 Marine Iron Works.....Chicago.
 Kingsford Foundry & Machine Works.....Oswego, N. Y.

REFRIGERATING APPARATUS.

Great Lakes Engineering Works.....Detroit.
 Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.
 Record of American & Foreign Shipping.....New York.

REPAIRS—ENGINE AND BOILER.

(See also Boiler Manufacturers and Engine Builders.)
 Georgian Bay Engineering Works.....Midland, Ont.

RIVETS, STEEL FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland, O.

SAFETY VALVES.

American Steam Gauge & Valve Mfg. Co.....Boston.
 Ashton Valve Co.....Boston.
 Crane Co.....Chicago.
 Lunkenheimer Co.....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
 Upson-Walton Co.....Cleveland.

SALVAGE COMPANIES.

See Wrecking Companies.

SCHOOLS—NAVIGATION.

Chicago Nautical School.....Chicago.

SEARCH LIGHTS.

General Electric Co.....Schenectady, N. Y.
 Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne Fuller Co.....Cleveland, O.
 Otis Steel Co.....Cleveland.
 Reading Iron Co.....Reading, Pa.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
 Atlantic Works.....East Boston, Mass.
 Bertram Engine Works Co., Ltd. Toronto, Can.
 Buffalo Dry Dock Co.....Buffalo.
 Cramp, Wm. & Sons.....Philadelphia.
 Craig Ship Building Co.....Toledo, O.
 Chicago Ship Building Co.....Chicago.
 Detroit Ship Building Co.....Detroit.
 Fore River Shipbuilding Co.....Quincy, Mass.
 Great Lakes Engineering Works.....Detroit.
 Jenks Ship Building Co.....Port Huron, Mich.
 Lockwood Mfg. Co.....East Boston, Mass.
 Maryland Steel Co.....Sparrows Point, Md.
 Milwaukee Dry Dock Co.....Milwaukee.
 Newport News Ship Building Co.....Newport News, Va.
 New York Shipbuilding Co.....Camden, N. J.
 Roach's Ship Yard.....Chester, Pa.
 Shipowner's Dry Dock Co.....Chicago.
 Smith & Son, Abram.....Algonac, Mich.
 Willard, Chas. P. & Co. Winthrop Harbor, Ill.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
 Marine Mfg. & Supply Co.....New York.
 Upson-Walton Co.....Cleveland.

SHIP DESIGNERS.

Kidd, Joseph.....Duluth.
 Kreer & Parsons.....Chicago.
 Matteson & Drake.....Buffalo.
 Rice & Lovejoy.....Buffalo.
 Steel, Nacey & Hynd.....Cleveland.
 Wood, W. J.....Chicago.

SHIP LANTERNS AND LAMPS.

Russell & Watson.....Buffalo.

SHIP TIMBER.

Martin-Barriss Co.....Cleveland.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co.....Jersey City, N. J.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co., Cuyahoga Falls, O.
 Reading Iron Co.....Reading, Pa.

STEAM VESSELS FOR SALE.

Gilchrist & Co., C. P.....Cleveland.
 Holmes, Samuel.....New York.
 Lester, S. S.....Quebec, Can.
 McCarthy, T. R.....Montreal, Can.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
 Anchor Line.....Buffalo.
 Boston Steamship Co.....Boston.
 International Mercantile Marine Co.....Philadelphia.
 New York & Cuba Mail S. S. Co.....New York.
 Red Star Line.....New York.
 United Fruit Co.....Boston.

STEEL CASTINGS.

Otis Steel Co.....Cleveland.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
 Chase Machine Co.....Cleveland.
 Detroit Ship Building Co.....Detroit.
 Hyde Windlass Co.....Bath, Me.
 Jenks Ship Building Co.....Port Huron, Mich.
 Marine Mfg. & Supply Co.....New York.
 Moulton Steering Engine Co.....New York.
 Sheriffs Mfg. Co.....Milwaukee.

SUBMARINE DIVING APPARATUS.

Morse & Son, A. J.....Boston.
 Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Gaskin, Edward.....Buffalo.
 Hynd, Alexander.....Cleveland.
 Lovejoy, H. O.....Buffalo.
 Matteson & Drake.....Philadelphia.
 Parker Bros. Co., Ltd.....Detroit.
 Nacey, James.....Cleveland.
 Rice, Henry.....Buffalo.
 Steel, Adam.....Cleveland.
 Wood, W. J.....Chicago.

TESTS OF MATERIALS.

Hunt, Robert W. & Co.....Chicago.
 Lunkenheimer Co.....Cincinnati, O.

TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co.....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Watson-Stillman Co.....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co., Providence, R. I.
 Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.

TRAPS, STEAM.

Kieley & Mueller.....New York.
 Sturtevant Co., B. F., Hyde Park, Mass.

TRUCKS.

Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.

Shelby Steel Tube Co.....Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.

VARNISHES.

VENTILATING APPARATUS FOR SHIPS.

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WINDLASSES.

WINCHES.

WOOD WORKING MACHINERY.

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WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co.....
Kingston, Ont.
 Parker Bros. Co., Ltd.....Detroit.

YACHT AND BOAT BUILDERS.

Bertram Engine Works Co., Ltd., Toronto, Can.
Drein, Thos. & Son, Wilmington, Del.
Georgian Bay Engineering Works, Midland, Ont.
Truscott Boat Mfg. Co., St. Joseph, Mich.
Willard, Chas. P. & Co., Winthrop Harbor, Ill.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.

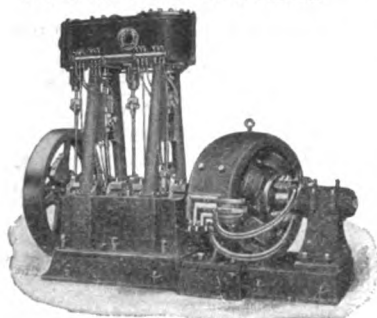
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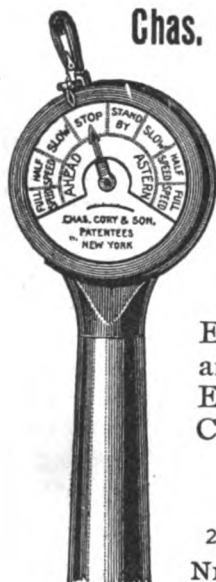
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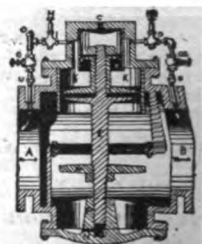
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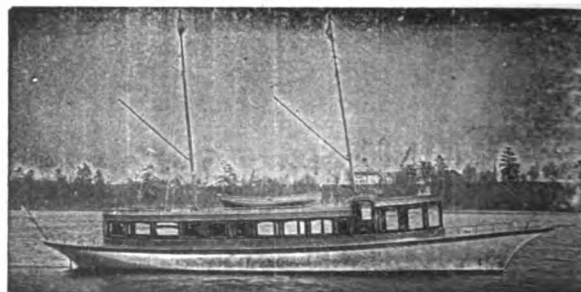
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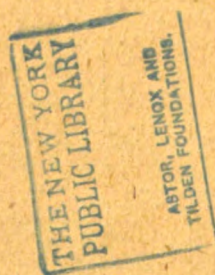


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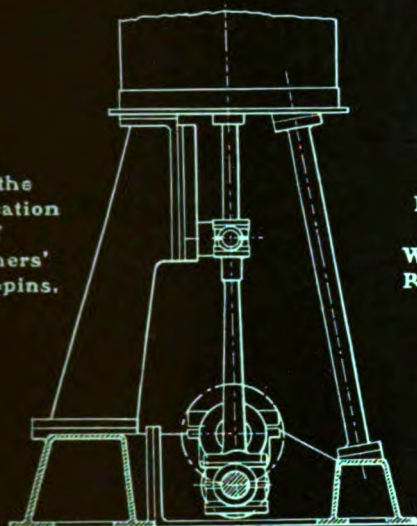
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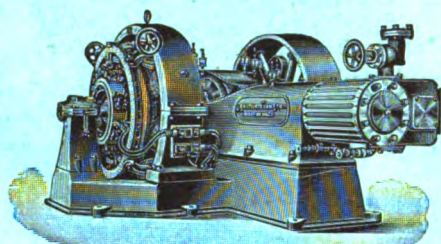
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LAKE SHORE AND MICHIGAN SOUTHERN RY.

Eastward	Arrive from West	Depart East
No. 18, Southwestern Limited		*1:50 a.m.
No. 22, Lake Shore Limited	*2:12 a.m.	*2:20 a.m.
No. 20, Chicago and Cleveland Exp.	*7:20 a.m.	
No. 28, New York and Boston Exp.	*7:40 a.m.	*8:00 a.m.
No. 40, Toledo and Buffalo Accom.	†10:00 a.m.	†10:30 a.m.
No. 32, Fast Mail	*11:25 a.m.	*11:30 a.m.
No. 48, Accommodation via Sandusky ..	†1:40 p.m.	
No. 42, Boston-New York Express		*11:45 a.m.
No. 44, Cleveland and New York Spl.		*3:00 p.m.
No. 46, Southwestern Express		*3:10 p.m.
No. 116, Ashtabula Accommodation		†4:30 p.m.
No. 6, Limited Fast Mail	*5:40 p.m.	*5:45 p.m.
No. 26, 20th Century Limited	*7:40 p.m.	*7:43 p.m.
No. 10, Chicago, N.Y. & Boston Spl.	*7:30 p.m.	*7:50 p.m.
No. 16, New England Express	*10:30 p.m.	*10:35 p.m.
No. 2, Day Express	†9:10 p.m.	†9:25 p.m.
No. 126, Norwalk Accommodation	†7:55 a.m.	
Westward	Arrive from East	Depart West
No. 7, Exposition Limited	*12:50 a.m.	
No. 11, Southwestern Limited	*2:55 a.m.	
No. 9, Day Express		†6:00 a.m.
No. 15, Boston and Chicago Special	*3:10 a.m.	*3:15 a.m.
No. 19, Lake Shore Limited	*7:15 a.m.	*7:25 a.m.
No. 23, Western Express	*10:30 a.m.	*10:35 a.m.
No. 29, Southwestern Special	†11:10 a.m.	
No. 33, Southwestern Express	*12:25 p.m.	
No. 133, Cleveland and Detroit Exp.		*12:45 p.m.
No. 47, Accommodation	†11:00 a.m.	†3:00 p.m.
No. 141, Sandusky Accommodation		†3:10 p.m.
No. 43, Fast Mail	*4:35 p.m.	*4:40 p.m.
No. 127, Norwalk Accommodation		†5:10 p.m.
No. 37, Pacific Express	*6:50 p.m.	*7:20 p.m.
No. 3, Fast Mail Limited	*10:50 p.m.	*10:55 p.m.
No. 115, Ashtabula Accommodation	*8:30 a.m.	

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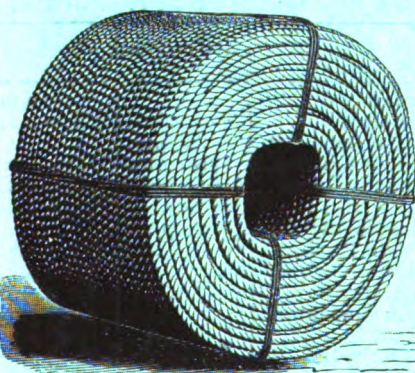
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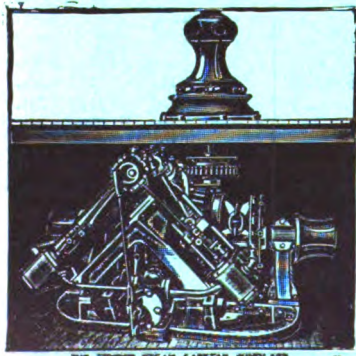
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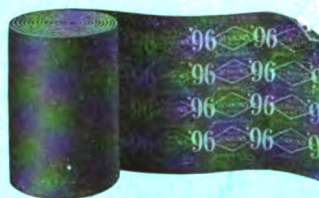
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